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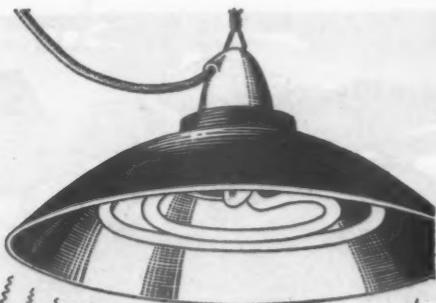
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Agriculture

Volume LXV

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EDITORIAL OFFICES

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The First Ten Years of the A.L.S.

R. G. A. LOFTHOUSE, F.R.I.C.S., F.L.A.S.

Ministry of Agriculture, Fisheries and Food

LOOKING back over the first ten years' operation of the Agricultural Land Service, one is immediately struck by the considerable changes which have taken place. The sudden death of its first Director, Mr. R. R. Ware, in April 1952 at the early age of 48, was widely regretted. He was succeeded by Mr. J. S. Hill, C.B.E., F.R.I.C.S., F.A.I., who, on his retirement in 1955, was followed by Mr. D. Christy, C.B.E., F.L.A.S., F.A.I.

From March 1948 to April 1957 the A.L.S. was organized on a four-tier basis—headquarters, province, district, and county. The Committee Land Agent, who was usually a Senior Assistant Land Commissioner, worked in the County A.E.C. office with a dual allegiance to the County Agricultural Officer and his District Land Commissioner; the latter was subordinate to the Provincial Land Commissioner. Following the Arton Wilson Committee's recommendations the A.L.S. has been organized, from 1st April 1957, on a three-tier system—headquarters, region and division. At headquarters, the Director is supported by a small headquarters staff; eight Regional Land Commissioners are responsible for A.L.S. work in their regions. Divisional Land Commissioners are responsible for A.L.S. work in each division, comprising one or more counties. The Committee Land Agent has disappeared from the scene, so that professional services and advice to C.A.E.C.s are now provided by the Divisional Land Commissioner and his staff. The A.L.S. numbers about 315 professional and sub-professional grade officers, including the architects and farm buildings advisory officers; in addition, there is a small research group concerned with land use matters, and draughtsmen and cartographers.

Land tenure

For the last ten years the A.L.S. has given professional advice and services in the administration of the Agricultural Holdings Act, 1948, which deals with various landlord and tenant relationships wherein the Minister has played a part, and Part II of the Agriculture Act, 1947, which provided for the maintaining of a reasonable standard of estate management and husbandry.

Under the 1947 Act, Committees "supervised" certain owners and occupiers; the A.L.S. was responsible for helping both the Committees and those under supervision. In all, 811 estate management and 4,200 husbandry supervision orders were made, but less than 3 per cent estate management and only 9 per cent husbandry dispossession took place—an indication of the effort made by both Committees and officers to help people under supervision and so avoid the final act of dispossession.

By 1st March 1958, the A.L.S. had helped Committees in the work arising from nearly 8,500 applications for consent to short-term tenancies (Sec. 2), 126 decisions on applications for a variation of terms of tenancy as to permanent pasture (Sec. 10), 934 applications for Certificates of Bad Husbandry

THE FIRST TEN YEARS OF THE A.L.S.

(of which 47 per cent were approved), 338 applications (84 per cent of which were approved) for consent to the tenant making improvements where the landlord had withheld his consent. Also, there were 6,765 applications for consent to notices to quit (of which roughly one-third were approved). The work of inspections, reports, proceedings and correspondence involved was considerable. Appointment of arbitrators in disputes under the Act, when the parties had failed to agree on the name of the arbitrator themselves, totalled 1,789; the rent to be paid for the holding was the most frequent issue in dispute.

Agricultural Land Tribunal

The A.L.S. provided a secretary to each of the Agricultural Land Tribunals set up in every region under Section 73 of the Agriculture Act, 1947, as appeal tribunals for certain issues arising from action under the Acts of 1947 and 1948. A total of 2,617 appeals have been heard up to 1st March 1958, including 2,177 appeals from decisions on cases concerning notice to quit.

Agriculture Act, 1958

In August 1958, Royal Assent was given to the Agriculture Act, 1958, one result of which is that C.A.E.C.s' responsibilities, and consequently A.L.S. duties, under the 1947 and 1948 Acts, are now considerably reduced. Briefly, supervision and dispossession will no longer occur; objections to notices to quit and other issues will be heard directly by the Agricultural Land Tribunal, whose secretary is to be an executive civil servant.

Land management

The A.L.S. land management work consists mainly of day-to-day management on behalf of the Agricultural Land Commission, which was set up under the 1947 Act to manage land placed under its control by the Minister. The Chief Agent is an A.L.S. officer seconded to the Commission for that duty. Between 1948 and 1955 the area of land managed by the Commission rose from 62,286 acres to 227,648 acres. By 1st April 1957, this area had fallen to 197,625 acres and is still decreasing as a result of the policy to dispose of land fit for sale.

The A.L.S. is concerned with the purchase and sale of land by the Minister. About 55,000 acres have been acquired. Of these, some 20,000 acres were brought into cultivation during the war and were purchased to keep in agriculture; some 10,000 acres were acquired for research, demonstration and experimental purposes, and this total also includes some estates such as the Ray Estate, Northumberland and Burnhall Estate, York, bought by agreement for improvement and now sold.

Some 42,500 acres of land, including land purchased by the Forestry Commission and former airfields managed by the Ministry, have been sold with the assistance of professional firms in 293 lots and realized about £1,300,000. Agreements have been reached with purchasers in respect of a further 14,000 acres in 120 lots, which will bring in nearly £500,000 more.

Hill Farming and Upland Improvement Schemes

Professional advice was given by the A.L.S. in improvement schemes submitted for grant under the Hill Farming Act, 1946, which provided funds to be disbursed at the rate of 50 per cent of the eligible cost of approved schemes. Joint schemes promoted by both owner and occupier were encouraged, and all schemes had to be comprehensive. This was also a requirement of schemes submitted under the Livestock Rearing Act, 1951, by which assistance was given, also at the rate of 50 per cent, to improvement schemes for farms lower down the hill than those helped by the 1946 Act. At 30th June 1958, 12,192 applications had been submitted in England and Wales, resulting in 8,895 "live" schemes for 9,909 holdings totalling 2,466,000 acres, with improvements estimated to cost £26,659,000. Of this sum, it was proposed to spend 29 per cent on farm buildings, 21 per cent on dwellings, 22 per cent on acts of husbandry such as reseeding pasture improvement, manuring or liming, and the remainder on water supplies, roads, bridges, fencing and the like. These Acts are still in force, and a farmer in upland areas may decide, if he wants to carry out a comprehensive programme, to submit a scheme for the 50 per cent grant rather than a Farm Improvement Scheme which does not insist on a comprehensive plan but offers a lower rate of one-third grant of the eligible cost.

Marginal Production Scheme

The A.L.S. has, until recently, also been concerned with the Marginal Production Scheme, which originated in the war-time Goods and Services Scheme, and has, broadly, helped an occupier to do useful and worthwhile work, such as small-scale land reclamation, which would have been uneconomic for him to tackle without assistance. Since 1948, schemes involving just over £8 million in assistance have been approved, for reseeding, reclamation, fertilizers and lime for farmland, claying and marling, cattle shelters, roads, grids, fencing, etc. The Marginal Production Scheme, the scope of which was restricted from 1st September 1957, will cover programmes only if they are submitted by 31st October 1958.

Farm Improvement Scheme

The Agriculture Act, 1957, Part II, introduced the Farm Improvement Scheme which came into operation on 1st September 1957, and can benefit all viable holdings. Over the next ten years £50 million is to be available in the United Kingdom to assist approved work at the rate of one-third of the eligible cost. Schemes need not be comprehensive; they must benefit land occupied with buildings; they must be reasonable in cost and such that a prudent landlord would be prepared to do the work or to compensate his tenant for doing it. At 31st August 1958, 42,248 applications had been received in England and Wales, and 20,009 have been approved; these applications relate to improvements costing over £14.3 million.

The A.L.S. is responsible for inspecting and recommending these schemes, and the amount of professional work arising from them and the sense of urgency attaching to the work is considerable.

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Advisory work

Demonstrations, conferences, estate walks, discussions and lectures have been arranged throughout the country since March 1948. About 30,000 requests for advice have been dealt with annually. The Farm Improvement Scheme brought such a rush of work that purely advisory activity has, of course, had to be reduced. However, during farm visits in connection with grant-aided schemes, opportunities occur for discussing such matters as improved design and the best way to tackle the renovation of old buildings or fit a new building into an existing steading. This is advisory work of a different but no less useful kind.

Publications and visual aids

Yet one advisory activity has steadily increased. In the last ten years 36 different leaflets have appeared in the Fixed Equipment of the Farm series and printing has run into half a million copies. Bulletins on pig housing, farm roads and estate yards have been published, and chapters contributed by A.L.S. officers to bulletins for which other parts of the Ministry are primarily responsible. To help officers in their advisory work, simple "standard" plans have been prepared showing good design. No details of dimensions and reinforcement are given and therefore they are not in any sense working plans.

With the help of Conditional Aid Funds, a 30-minute film was made in 1955. It was called *Buildings for the Modern Farmer* and has been very popular with farming audiences. A few very short film sequences on buildings and other fixed equipment have proved most useful as lecture aids.

The Ministry's stand is a well-known feature at all the major agricultural shows and attracts thousands of visitors every year. The A.L.S. has been responsible for contributing the estate management part of the Ministry's exhibits, the first occasion being the Royal Show at York in 1948.

Land Use work

Development of land for housing, industrial, educational and other purposes has made considerable demands on agricultural land. The A.L.S. advise planning authorities and other government departments of the effect on agricultural interests of development proposals, and also advise the Ministry's Land Use Division on matters dealt with between departments at headquarters level. This work has included making agricultural appreciations of areas surrounding towns in order to assist local planning authorities in the preparation of their development plans and town maps, as well as advising on specific proposals for the change of use of agricultural land.

Ironstone working and opencast coal

In those Midland counties affected by ironstone working, the A.L.S. makes arrangements with owners and occupiers for the restoration to agricultural use of land which has been worked for ironstone. To help meet the cost of

THE FIRST TEN YEARS OF THE A.L.S.

the special cultivations and fixed equipment necessary for such land, grants are paid from the Ironstone Restoration Fund set up under the Act.

At all stages of opencast coal activities, the Land Commissioner is the officer of the agricultural department with whom the Ministry of Power and the National Coal Board Executive maintain liaison. He is consulted on the forward opencast coal programme and on all prospecting and working proposals. All opencast coal operations are subject to clearance conditions prescribed by the Land Commissioner for the protection of the agricultural interests and the restoration of the land, and the Land Commissioner is responsible for ensuring that these conditions are fulfilled before, during and after the extraction of the coal. The Land Commissioner, in co-operation with his colleagues of the N.A.A.S. and other technical officers of the Ministry, is also responsible for the special course of agricultural after-treatment and management given for a period of five years or so whilst the land is being brought into a condition fit for normal farming again.

Forestry

Under the 1945 Forestry Act, the Minister has power to acquire land in England and Wales to be placed at the disposal of the Forestry Commissioners for afforestation, and also to manage land acquired by him which is not for the time being placed at the disposal of the Forestry Commissioners. When the Conservator of the Forestry Commission hears of a property which may be suitable for afforestation, he consults the Ministry's Regional Land Commissioner, who considers to what extent agricultural interests are affected and whether parts of the property to be acquired should be kept permanently, or temporarily, in agriculture. The Land Commissioner also advises the Conservator on tree-felling licence applications, where agricultural interests may be affected. In addition, there is consultation between the Land Commissioner and the Conservator on applications for grant-aid schemes for land in which both the Ministry and the Forestry Commission may be interested.

Smallholdings

The A.L.S. manages the Ministry's farm settlements and has duties in connection with County Council smallholding improvement schemes and the Land Settlement Association estates. The last ten years has been a time of restricted capital expenditure, except for essential items. This has meant that the emphasis has been on the improvement of existing smallholdings rather than on the establishment of new ones.

Research

The A.L.S. does all it can to keep its professional and technical knowledge up to date. It comes across practical problems which beset owners and farmers and, where these are capable of scientific investigation, brings them to the attention of the Agricultural Improvement Council's Land Management Committee, set up in 1953 under the chairmanship of the Duke of Northumberland. Interest in research into the problems of farm buildings

THE FIRST TEN YEARS OF THE A.L.S.

has quickened in the last few years, and the recent decision of the Agricultural Research Council to co-ordinate farm building research was warmly welcomed. Most building research work useful to agriculture is of a general character—for example, building research sponsored by the Department of Scientific and Industrial Research. The Ministry's direct sponsorship of research in this field and that of land management and equipment is concentrated on investigation of special problems important to agriculture.

Recruitment and training

The response of young professional men to the occasional advertisement for junior officers has generally been satisfactory, and the efficiency of the A.L.S. has been furthered by in-service training courses, which all officers have now undergone. Five A.L.S. officers have been fortunate enough to secure Kellogg Foundation Fellowships taking them to an American university for a year. One Fellow took advantage of this to train in work study, a skill of particular value now there is increasing interest in its application to agriculture. A second officer was one of a group trained by I.C.I. Ltd., as a contribution to the further introduction of work study into agriculture. Officers have taken part in O.E.E.C. conferences and missions. One officer was seconded to F.A.O. and one to O.E.E.C., both in connection with farm buildings. Another was seconded to the Agricultural Research Council's newly-established Farm Buildings Unit.

General

Certain trends in A.L.S. work have been marked. After a few years the amount of "supervision" work began to diminish. Work in connection with improvement schemes has steadily increased and is likely to go on. Advisory work has had to change; there is little time for group activity, but opportunities for giving personal advice to an applicant and his advisers arise during discussion of an improvement scheme; demand for articles and talks from the A.L.S. continues steadily. Keeping the technical knowledge of the A.L.S. up to date is a problem always present with busy professional men who have little spare time for reading.

After the varied duties of the last ten years, the A.L.S. looks forward to the next decade as a time of great opportunity to assist in the improvement of our farms.

CORRECTION. Dairy By-products in Stock-feeding (September 1958 issue, p. 311). The last sentence should have read: Preliminary experiments using skim milk with 0·1 per cent formalin seem to show that it is a palatable and nutritious food for young calves, provided a change-over period of about two weeks from whole milk is used.

Some Economic Effects of Grassland Improvement

C. H. BLAGBURN, B.Sc.(AGRIC.), N.D.A.

University of Reading

There can be no doubt that a policy of grassland intensification pays. It can increase profits for the farmer and reduce national expenditure on food and feedingstuffs.

INCREASING the productivity and efficiency of grassland, and so saving imports of livestock products and animal feedingstuffs, is one of the biggest contributions British agriculture can make to easing our balance of payments difficulties. It is not surprising, in view of this, that during 1957 the Ministry of Agriculture set up an expert committee to consider ways and means of getting farmers to make full use of their grassland. For in spite of the important technical developments in grassland management which have taken place during the past twenty years, a large proportion of the acreage under grass is still not as productive as it might be.

Apart from its importance to our national economy, intensifying output from grassland—or, indeed, of bulky forage output generally—can help to push up profits on the individual farm. It goes without saying that a policy of grassland intensification must include plans for the full use of the extra forage produced, though these are not always properly thought out. There are three possibilities:

Additional grass can be used to carry more livestock, thus raising the gross output of the farm, often with relatively little increased expenditure. Existing stock can be kept on a smaller acreage of grass, thus freeing land for the production of more sale crops.

The additional bulky forage can be used, particularly on the dairy farm, to replace concentrates, thus reducing the total purchased food bill. Or, of course, there may be a combination of any of these.

The particular policy adopted will depend largely on the circumstances of the individual farm. Increasing stock numbers may be prevented by lack of capital, labour or accommodation. The replacement of grass by sale crops will be influenced by soil, climate and rotational considerations, and so on.

Whichever course may be followed, research leaves little doubt as to the economic advantages of grassland intensification. The following are some typical figures obtained from a sample of 165 farms in the south of England by the Agricultural Economics Department of Reading University in 1956-57. If these farms are grouped on the basis of their average starch equivalent output per acre of forage, Table 1 shows the average gross income, the average total expenditure and the average surplus per 100 acres for the highest and lowest groups.

The group of farms with high forage productivity obtained a gross income about 17 per cent higher than those with low productivity, but their surplus or profit was 120 per cent higher.

Whereas in the more productive group 25 farms out of 42 (60 per cent)

SOME ECONOMIC EFFECTS OF GRASSLAND IMPROVEMENT

earned surpluses of over £5 an acre, in the other group only 13 out of 51 (25 per cent) achieved this level of profit.

The additional surplus obtained by the more productive group of farms was entirely due to their higher gross income—£4,176 per 100 acres compared with £3,557 for the less productive group—and the higher total income is fully accounted for by their additional output of livestock products.

Table 1

	Farms where S.E. per acre of forage is:	
	10 cwt or less	14 cwt or more
No. of Farms	51	42
Average S.E. per acre of forage (cwt)	8·5	16·0
	£	£
Gross income per 100 acres	3,557	4,176
" " from livestock per 100 acres	2,627	3,138
Total expenditure per 100 acres	3,262	3,514
Surplus per 100 acres	295	664

More stock, but less bought feed

The effects of the higher productivity in terms of stock density and food and forage utilization are indicated by the following table.

Table 2

	Farms where S.E. per acre of forage is:	
	10 cwt or less	14 cwt or more
Livestock units per 100 acres devoted to feed crops	36·6	55·2
Bulky forage acreage per unit of grazing stock	3·0	1·8
Food purchases per 100 acres (£)	1,002	998
" " " L.U. (£)	33·2	22·3

The significant points emerging from these figures are:

- (a) The much greater stock density resulting from more intensive forage output: each livestock unit—or “cow-equivalent”—required only about $1\frac{1}{2}$ acres of bulky forage, compared with 3 acres on the less intensive farms.
- (b) Although 50 per cent more stock were carried, the most intensive farms bought no more feedingstuffs than the least intensive: their food purchases per head of stock were thus one-third less. In fact the more productive farms obtained 75 per cent of their total food requirements from the farm acreage and only 25 per cent from purchases, whereas for the less productive group the ratio was 65:35. As bought food costs more than home-grown in terms of equivalent food value, this is an important factor in total profits.

Naturally the attainment of a high level of grassland intensity and its full utilization will cost money. Expenditure on fertilizers will be higher, and increased labour costs will be incurred in conserving the greater volume of bulky forage produced and in tending the additional livestock kept. But in general the extra costs will be more than offset by the higher output: Table 1, for example, shows that with higher total expenditure amounting to about £2 10s. an acre, output increased by over £5 an acre.

A more important point is the extra capital required. Taking into account

SOME ECONOMIC EFFECTS OF GRASSLAND IMPROVEMENT

only livestock, machinery, growing crops and produce in store, the average tenant's capital investment per 100 acres on the farms with higher forage productivity was £3,900, compared with £3,200 for the less productive group—an additional requirement of 22 per cent. Given the extra capital, however, its use was fully justified by results, for the average surplus represented 17 per cent on capital on the more productive farms, compared with only 9 per cent for the other group. On the extra capital employed, the additional surplus earned represented a return of over 50 per cent.

Making the most of the extra grass

The best way of using increased forage output is likely to vary from farm to farm, and it will be influenced by such factors as size of farm, type of stock kept, yield per cow on dairy farms, the level of overhead costs, buildings available, labour and capital and so on.

If food costs were the only consideration, the most economical use of increased forage output from grass on the dairy farm, especially where expenditure on feedingstuffs is at present heavy, would be to replace bought food for existing stock rather than to increase stock numbers. If, for example, the starch equivalent output of 10 acres of grass is raised by 5 cwt per acre (roughly 2 tons per acre more silage or 15 cwt more hay) and the whole of the additional forage is used to replace purchased cake for an already existing dairy herd, it should be possible, with efficient feeding, to save some 3½ tons of cake, costing over £100 at present prices. If, on the other hand, two more dairy cows were introduced, almost the whole of the additional food would be needed to maintain these extra cows, leaving only a small contribution towards their milk production—probably the equivalent of less than 300 gallons of milk, worth about £40 at present prices. The question of food costs is not, however, the only consideration: the effect on the overall farm output is also important. In the case mentioned above, the additional two cows will produce, at average yields, 1,400 gallons of milk; and even if all of this had to be provided for by buying concentrates at the rate of, say, 4 lb per gallon, there would still be a margin of something like 1s. 10d. a gallon over the extra food cost at present prices, giving an extra total profit of around £130.

On many farms there is scope for some moderate stock increase without appreciably raising standing charges such as labour and general overheads, and in such cases any margin over and above food costs on the extra cows is virtually all profit.

In general, it seems likely that for medium-sized and large dairy farms, where any increase in cow numbers is often ruled out by limitations in labour supply, building accommodation or by difficulties of access, additional supplies of forage from grassland intensification can best be used to replace bought food in the cows' ration or to enable the existing herd to be kept on a reduced acreage. This would set free grass for the production of other stock such as beef cattle or sheep, or to be ploughed up for sale crops. On the small dairy farm, on the other hand, where maximum turnover is all-important, and where more cows can often be handled with existing labour, herd expansion is more likely to be the right policy, especially if the herd is one of high-yielding cows.

Zero Grazing on a Berkshire Farm

RICHARD WELLESLEY, M.C., D.L.

Buckland Estate, Faringdon, Berkshire

Mr. Wellesley is convinced that zero grazing, introduced on his farm as an experiment last year, has great possibilities as a system of producing good quality milk cheaply in this country.

MANY people are now really interested in zero grazing, but before starting they want a clear picture of what the system really involves. I saw zero grazing in America in 1956, when on a Nuffield Scholarship. Twenty cows were eating from a trailer which had been filled by a harvester and drawn back to the buildings. I also saw 18,000 beef animals being fed all the food they required by four men driving self-unloading side-delivery lorries.

At Buckland we began zero grazing in May 1957. My partner, Major John Fletcher, and I decided to start the experiment to try and overcome some of the difficulties of managing dairy cows on my awkwardly shaped farm, to save food and reduce the total cost of milk production. We are now zero grazing 140 cows.

When planning the introduction of the system, I feel it to be essential that the whole farm management should be carefully thought out—the buildings, the equipment, the routine on the farm and the land, and stock. The article "Zero Grazing of Dairy Cattle", by Mr. K. V. Runcie, in the June issue of *Agriculture* and my article, "Zero Grazing Experiment in Berkshire", in *The Times Agricultural Supplement* of 1st July give many details of the system.

Daily routine

In the morning the cows are milked and receive half their concentrates in the parlour. If there is any green material left in the mangers it is swept out. As soon as possible after milking, and at exactly the same time every day, the cows get 60–75 lb of the best food available on the farm. This may be grass, lucerne or green oats, and a little hay or chopped straw when needed to keep the manure to the right consistency. Minerals and rolled oats are mixed by the action of the trailer when self-unloading. The water-troughs are close by the mangers and electrically heated by a kettle element in the winter. The cows then eat and lie down. Later in the afternoon the same amount of green food is unloaded. The cows have become extraordinarily quiet and contented. It is easy and interesting to watch them and adjust their rations accordingly. The yards are most conveniently scraped when the cows are in the collecting yard.

Cutting and transport

We have found that the harvester must be able to cut and load long grass and lucerne when it is raining hard. The cows must be fed at the same time every day. The tractor has to be able to pull the trailer full of wet material

ZERO GRAZING ON A BERKSHIRE FARM

from the field. In other words, we have found that it is necessary to plan for the worst conditions, which one hopes will happen only very occasionally. The trailer sides let down if the green material is to be unloaded by hand.

To mechanize the handling, we imported the first self-unloading side-delivery trailer last year. The machine will not work with long or lacerated material. We then imported a cutter-chopper-loader which will chop, if required, to as short as half an inch. The self-unloading trailer unloads material chopped to 2 inches very well indeed at 3 tons in seven minutes in a controlled stream into the mangers. If a manufacturer could produce a trailer which would unload lacerated material, zero grazing would be made much easier for people who have one of the many harvesters manufactured in this country. However, some people are unloading all their green material by hand.

When we are making silage the chopped material is unloaded from our lorries by being pushed out of the back by a false end gate on to a conveyor, and blown into the silo at a considerable rate. We filled a nine-bay Dutch barn from each end. I think the best way to harvest short grass is with a gang-mow loader. Very short grass with a little straw has produced very good results.

It is advisable to have an alternative method of getting the food to the cows in case the harvester or trailer breaks down, even if it is a very laborious method. The harvester and trailer, or lorries, must have sufficient capacity to feed the cows and make silage when the grass and weather conditions are right and not let the grass run away to seed.

Clean, ventilated buildings

The mangers, we have found, should be 2 feet 6 inches to 3 feet long for each cow, and they should be set in a straight line for ease of tractor driving. If made of wood they should be strengthened with a rail or rubbing strake along the tractor side, in case the tractor or trailer is accidentally driven into it. The height of the rails on the cows' side should be adjustable to prevent the animals' necks being rubbed sore; also to facilitate the feeding of young stock.

The road should be even and concreted. Other kinds of road surface do not stand up to the traffic of twice daily feeding. Our concrete cow-yards slope away or to the sides, but not towards the mangers. Bare concrete scraped daily will save straw, compared with covered or open strawed yards; sloppy manure on the yard is easily pushed to the side by a tractor fitted with a standard foreloader scraper blade. We have improved the scraping by fitting two side plates in a special way. The removal of the sloppy manure from the side of the yard may be done in several ways but it must be carefully planned. It may be pushed by a scraper up a ramp into a manure-spreader tank and taken away daily; it may be pushed into a concrete manure midden for removal later, or there is the new and interesting way of pumping it out on to the fields in a similar manner to irrigation.

Ideally, I believe a tractor-mounted rotary brush would further clear the yards and help to keep the cows cleaner. The important thing about the yard is that it must be easy to scrape, with as few obstructions as possible. Storm water disposal, in the event of a cloudburst, must also be considered.

ZERO GRAZING ON A BERKSHIRE FARM

The covered bedded area must be well ventilated. I suggest a barn, airtight at the back and sides and roof, and open in the front 12 feet to the eaves. Any opening other than that in the front may cause a draught. We have been amazed to find how, when they have a free choice, the cows much prefer a barn with open sides to the ordinary, conventional cowshed.

Ventilation is also very important for drying the bedding. Opinions differ widely concerning the amount of bedded area which each cow requires. Some people think that 45 sq. feet is sufficient. Some American universities suggest 100 sq. feet. Personally I think that a minimum of 100 sq. feet is needed with proper ventilation, provided the barn is not more than 25 feet from back to front. The larger the area and the better the ventilation, the less straw will be used. We put straw on the bedded area every day.

The floor of the barn, on a well-drained site, can be of earth and can be excavated to about 1½ feet. Allowance must be made for the manure to rise 3 feet and be removed twice a year. A wall about 1 foot high along the front of the barn, we find, helps to prevent the straw from being dragged out by the cows into the yard. I feel there will be a place for chopped straw when full mechanization is achieved.

Improved health

Many people immediately remark on how well the cows look. Their legs and feet have improved since they have been in the yards. The fertility has been quite satisfactory in the past, but it has slightly improved since we have been zero grazing. The general veterinary attention has, so far, been less.

I think zero grazing will work satisfactorily if the system is carefully planned to provide adequate mangers, road, yard and bedding area, and that the routine and equipment is able to bring in the green food on time and remove the manure regularly.

★ NEXT MONTH ★

Some articles of outstanding interest

RABBIT CONTROL IN AUSTRALIA AND NEW ZEALAND by H. V. Thompson

TRANSPORT OF SOFT FRUIT IN INSULATED CONTAINERS by W. H. Smith
and G. Mann

DOCK SAWFLY by H. W. Miles

PASTURE-REARING BUCKET-FED CALVES by D. T. Chambers, F. E. Alder
and William Davies

Piglets from Birth to Weaning

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In general, the heavier the pig at birth, the easier it is to rear, and the heavier the weaner, the better it will fatten.

PIGS are born in a rather advanced stage of development: they can see, walk, are covered with hair, and within minutes of birth will find their mother's udder and settle down to suck the teat of their choice. At birth more than 80 per cent of the pig's body is composed of water, but as the pig grows older the composition changes very quickly indeed. Values for the approximate composition of pigs' carcasses at birth, weaning (30-40 lb live weight) and slaughter (bacon, 200 lb live weight) are given in the following table.

Table 1

Approximate chemical composition of the pig at various stages of development (per cent)

	Water	Protein	Fat	Ash
At birth	81.5	12.4	1.9	4.2
At weaning (30-40 lb)	64.0	12.8	19.6	3.6
At slaughter (200 lb)	50.0	13.5	33.5	3.0

Although young pigs appear capable of looking after themselves soon after birth, many losses occur during the first few days of life, and the success or failure of a pig enterprise depends largely on the ability of the pig-keeper to rear his pigs satisfactorily. The higher the number of pigs reared per litter, the better is the financial outlook of the enterprise. Under the conditions currently prevailing in this country, one can postulate that the performance of a sow is unsatisfactory unless she produces a minimum of 14 well-reared pigs a year. One should aim at an average of at least 16 pigs; the more the better, provided, of course, they are of reasonable quality at the end of the rearing period.

It is most disturbing that under present-day rearing conditions 20-25 per cent of all pigs born do not reach the age of eight weeks. Some of these losses are probably unavoidable, but with good husbandry pig-keepers should be able to reduce the losses by at least half—there are some herds where the average losses are below 10 per cent. Attempts over recent years to reduce losses have resulted in innovations including farrowing crates, infra-red lamps and brooders. These have all made a contribution towards reducing losses, particularly those due to overlaying by the sow. About half the losses during the first 2-3 days of life are recorded as due to overlaying, although the exact cause of death may be difficult to ascertain as it is often impossible to know whether overlaying was accidental or due to illness or weakness of the baby pig. Proper feeding and management of the sow before and after parturition are undoubtedly the most important factors in ensuring that baby pigs are well endowed at birth to face the hazards awaiting them in life.

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Aim at heavy weaning weights

In general the heavier the pig at birth, the easier it is to rear satisfactorily. A definite relationship exists between birth weight and weaning weight; this is well illustrated in Table 2.

Table 2

Relationship between birth weight and weaning weight (at 8 weeks) based on data from a single herd (3,000 pigs)

Birth weight lb	Weaning weight lb
Below 2.0	24.5
2.1-2.5	27.5
2.6-3.0	32.0
3.1-3.5	37.0
3.6-4.0	42.0

Small, weak pigs not only have less chance of survival, but may be responsible for restlessness in the pen, adversely affecting the rest of the litter and possibly other litters in neighbouring pens.

Every effort should be made to get as high weaning weights as possible without loss of quality; there is strong evidence that the heavier the weaner the better is its overall fattening performance. Average weights of at least 40 lb at 8 weeks should be aimed at. Only the other day my attention was drawn to a pig enterprise where weaning weights of about 78 lb at 8 weeks are obtained regularly. I have had no chance as yet to study the circumstances under which such a high performance is obtained, but it is heartening to know that it is possible.

Housing, management and feeding are the factors which jointly determine the number and weight of pigs reared per litter. Very little can usefully be said about housing the sow and litter. There are many different types of farrowing houses which appear to serve their purpose reasonably well. Obvious essential features of these houses are that they provide a dry bed, ensure freedom from draughts and have reasonable facilities for feeding and watering the sow and litter. At present it is not possible to define ideal conditions for rearing pigs, and a lot of experimental work will have to be carried out before it can even be seen if a definition of this kind is possible.

For reasons unknown, pigs reared out of doors weigh heavier at weaning than those reared indoors. Obviously then, pigs should be reared out of doors whenever possible, and it will depend on local circumstances as to whether the sows are tethered, kept with the litters in portable houses with outside runs or kept on a range system.

When pigs are kept indoors, steps must be taken to prevent nutritional anaemia, a condition which arises from a deficiency of iron in the diet of very young pigs. During the first few weeks of life, pigs depend on sows' milk as the sole source of food, and like any other milk it contains very little iron, not enough to cover the requirements of rapidly growing pigs. It is essential to provide iron supplements to all pigs reared indoors. Pigs reared out of doors can obtain additional iron from the soil. The method of pro-

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viding supplemental iron is immaterial, provided it is given in a form which can be assimilated by the young pig. Effective methods range from dosing with liquid iron preparations on several consecutive days, or dosing with iron tablets or iron paste, to a single intramuscular injection. Treatment should always begin not later than four days after birth. At Shinfield the method over the past twenty years has been to dose with 2 ml of a solution of iron pyrophosphate once daily for 4-5 days, starting when the pigs are three days old. This solution is made up simply by dissolving about 2 oz commercial iron pyrophosphate in 1 pint of water. The cost of the treatment is less than 1d. a pig. Intramuscular injections of iron cost between 1s. 6d. and 2s. 6d. a pig. As far as prevention of anaemia is concerned, both these treatments are equally effective.

Farrowing

In my opinion, an important point in management is that whenever possible farrowings should be attended. The function of an attendant is to look after the well-being of the newly-born, rather than to help the sow during parturition; only occasionally is any help needed. As soon as the pigs are born, their navel cords should be severed about two inches from their base, they should be wiped with a cloth dampened in a mild disinfectant and then with a dry cloth. The piglets should then be put into a box. When the farrowing is over, or nearly over, depending on the time taken, the complete litter should be returned to the sow for nursing, preferably after the teeth of the young pigs have been cut off. These teeth are needle sharp and unless removed may be responsible for scratches or even wounds—a considerable but unnecessary hazard.

Information which is particularly valuable in pedigree herds can be obtained by weighing the pigs at or within a few hours of birth. Birth weights can help the breeder to judge the efficacy of his system of managing and feeding pregnant sows. They can also provide additional information for ascertaining the worth of his breeding stock. Selection for high birth weights in litters may be worth consideration.

Pigs appear to suckle little and often, and following birth will do so approximately once every hour day and night. At each suckling the milk flow lasts only 10-20 seconds, the piglets obtaining 10-70 ml milk. Up to 48 hours after birth the pigs receive colostrum. Thereafter it is gradually replaced by milk. The main value of colostrum is to provide antibodies which protect the baby pigs against various infections.

When the litter is 3-5 weeks old, all male pigs except those required for breeding should be castrated; some people prefer to castrate at an earlier age, but although the operation can be carried out within a few days of birth, it is easier when the pigs have grown a little. It is most essential that the operation should be performed efficiently, and a very sharp knife and disinfectant should always be used. Knives with replaceable blades are very useful, as the blades are relatively cheap and can be discarded after use on one or two litters.

At the time of castration, pigs in each litter are often permanently marked. Tattooing has obvious advantages, but with dark-skinned animals other means of individual identification must be resorted to.

When to wean

There is always the controversial problem of when to wean. The orthodox method, still widely practised, is to wean at eight weeks of age. Earlier weaning can be satisfactory, but no general recommendations can be made—the decision must depend on the prevailing circumstances and take into consideration the development of any particular litter. Under many conditions of husbandry, weaning at six weeks has proved satisfactory. Weaning before six weeks calls for completely different rearing methods, which will be discussed briefly in the last paragraph of this article.

At whatever age pigs are weaned, the operation should involve removing the sow from the pen rather than moving the litter. When several litters are weaned within a few days it is often advantageous to mix them and reallocate the pigs to pens in appropriate numbers according to weight, since the more uniform the pigs within a pen the better. The pre-weaning ration should be continued for several days after weaning and be changed gradually.

Soon after weaning, pigs should be wormed. Nowadays this treatment is so simple, safe and relatively cheap that it should be carried out as a matter of routine. Piperazine preparations are very effective. At about weaning time vaccination against swine fever and swine erysipelas should also be carried out.

Frequent weighing

The development of litters should be continually watched. Table 3 gives figures that can be considered as normal ranges for the first eight weeks of life: weights below the lower limit for any age generally show unsatisfactory development. Weights above the higher limit indicate good development.

Table 3

Weight range of pigs during the first eight weeks of life

Age weeks	Weight lb
At birth	2.5- 3.0
1	4.5- 6.5
2	6.5- 9.0
3	9.5-12.5
4	12.0-16.0
5	15.5-20.0
6	19.0-25.0
7	23.0-32.0
8	28.0-40.0

An experienced pig-keeper should be able to judge the weight of a young pig fairly accurately, but check weighings should be an integral part of an efficient rearing routine.

Pig recording is essential in pedigree herds, and in commercial herds whose owners take an interest in the performance of their breeding stock. In the national pig recording scheme, weighing at eight weeks is compulsory, and at three weeks optional. The latter is usually regarded as an indication of milking ability of the sow, but I prefer to regard it as a check weight on the rapidly growing pig.

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Supplementary feeding

When considering the feeding of young pigs, it is necessary to recognize that except for iron, sows' milk fails on quantity rather than quality and therefore every effort should be made to provide a sufficiently nourishing supplementary feed. Knowledge of pig nutrition is sufficient to formulate rations as sound as sows' milk, or possibly even better, but the cost of such rations will usually be prohibitive. One must always seek the most effective compromise between the ideal composition and the cost of ingredients. Generalizations should be avoided: what may give satisfactory results in one set of circumstances need not do so in another.

Supplementary feeding should begin when the pigs are about 14 days old, and is usually given in a creep. The food is best given dry and *ad lib.* in a low trough. Fresh water should always be available. Creep rations should be properly balanced, and cover the known requirements for protein, energy, minerals and vitamins, with some safety margin. Palatability is important, because the sooner the pigs start eating solid food, and the more they consume, the better. Flavour and physical properties appear to influence palatability, but our understanding of these factors is as yet superficial. Young pigs appear to like crumbly food: this is why flaked maize is a favourite ingredient of creep rations. The pigs like sweetness and a little sugar or molasses make rations more attractive. It has been claimed that pellets are better than meal, but the evidence is not very convincing; pellets may have an advantage by being less wasteful. The addition of antibiotics to creep feeds is normally a sound investment; not only will it reduce some of the troubles often experienced in rearing pigs, but it will usually improve both the growth rate and efficiency of food conversion.

Table 4 gives the composition of a creep feed used at Shinfield over a number of years which has given reasonably satisfactory results. Undoubtedly, other mixtures are as good or better. The best advice that can be given is that observation, experience and possibly some comparative test within a farmer's own facilities should provide the basis for formulating the most effective rations for your pigs.

Table 4
Composition of a creep meal

	per cent
Weatings	30
Dried skim milk	25
Barley meal	20
Flaked maize	15
White fishmeal	10
Rovimix (vitamins A and D)	44 g per 100 lb
Ferrous sulphate	8 g per 100 lb

As more liquid skim milk becomes available to pig-feeders, some are wondering whether they can use it for feeding to young pigs. Skim milk is a valuable feed, but has one major shortcoming when fed to young pigs—namely, a low dry matter content (usually around 9 per cent). The capacity of young pigs to take liquid is rather limited, and therefore to obtain good results from skim milk feeding, its amount must be restricted. One can start

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with about $\frac{1}{2}$ lb of skim milk per pig per day at about 3 weeks old, and give about $2\frac{1}{2}$ lb at 8 weeks. It is essential that the skim milk should be fed either very fresh or completely sour, and that the utensils employed be clean.

Care in early weaning

Finally, a brief word about artificial rearing and early weaning. In the state of our knowledge, artificial rearing, by which is meant the removal of pigs from their mother either at birth or soon afterwards, is not a practical proposition. If circumstances compel it, as for example when a sow dies and orphan pigs have to be catered for, it is certainly worth while attempting to rear the litter artificially: as an ordinary routine, with normal litters, it should not be attempted. Early weaning of pigs, say between 10 and 14 days old, on to a dry feed is, on the other hand, quite feasible in practical pig-keeping. There are several proprietary mixtures available which quite adequately cover the nutritional requirements of a young pig. Before undertaking early weaning as a routine, however, one should satisfy oneself that under the conditions prevailing in an individual pig enterprise the economics of it are sound. Often they may not be. In any case, additional care and skill, better sanitation, better equipment and accommodation are all essential for ensuring a lasting success with early weaning.

Progress in Eradicating Tuberculosis

Good progress continues to be made in eradicating bovine tuberculosis. On 1st March 1958, five eradication areas were declared in counties in the south-east and south-west of England, and in north, central and south-east Scotland. Compulsory tuberculin testing has since been carried out there of herds which were not attested on that date. Cattle reacting to the test have been removed and slaughtered, and the areas are ready for full attested status.

At 30th June 1958 there were about 7·8 million cattle in attested herds and attested areas in Great Britain, compared with 3·9 million five years ago and 1·4 million ten years ago. Eighty per cent of the cattle in the country are now attested: in England 72 per cent, in Wales 94 per cent and in Scotland 95 per cent.

Now that the Tuberculosis (Southern England Attested Area) Order, 1958 and the Tuberculosis (North, West, Central and South Scotland Attested Area) Order, 1958 have come into force, nearly half the cattle in Great Britain are in attested areas, and there are a further 5·4 million cattle in areas which are now being developed, with the assistance of free tuberculin tests, with a view to their declaration as attested areas during the next two years.

When an area is declared attested, control by licence of cattle movements within the area is relaxed, but prohibition of movement of cattle *into* the area, except under licence, continues.

From Farm to Shop

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The price the consumer pays for farm produce is often said to be too high in relation to the farmer's return. The writers of this article say, however, that for some important foods only one-third of it goes to the distributor and two-thirds to the farmer.

THE middleman is not very popular with farmers. Although most farmers have cordial relations with their merchants, and farmers' wives with their shopkeepers, there are frequent complaints about the gap between prices in the shops and those paid to the producer: the middleman is criticized for taking too large a share of the retail price. Though sometimes justified, no doubt, these criticisms often fail to take account of the fact that in a complex modern society marketing is as important as production. Farmers too often regard the marketing of farm products as of relatively minor importance compared with the serious business of producing them. Though understandable, this is a mistaken view. Live animals, milk, or vegetables on the farm are no use at all to the urban housewife and, in processing and moving products from the farm to the shop, the middleman performs a function just as essential as the farmer's. Even if, in doing so, he adds 50 or even 100 per cent to the price paid to the farmer, this does not *necessarily* prove that the distributor's costs or profits are too high. It is true, nevertheless, that every step should be taken to make distribution as efficient as possible; indeed its growing importance emphasizes this need.

It is unfortunate that so little information is published in this country on the costs of marketing farm products—far less, for example, than in the U.S.A. More facts and figures would enable discussion of marketing problems to be better informed, and might help to pinpoint weaknesses in the chain of distribution.

Influence of processing and pre-packing in the U.S.A.

American experience since 1945 indicates the sort of developments farmers can expect in Britain. The growth of large self-service supermarkets selling all kinds of food products under one roof has lowered the labour costs of retailing, but this has been more than offset by increased expenditure on processing and pre-packing. Oven-ready poultry, fresh-frozen vegetables, joints of meat in transparent wrappings, and indeed whole meals prepared and frozen, are available in all the shopping centres. These developments have their slightly ludicrous side, such as "starchless" bread and "low calorie" beer designed to allow overeating and overdrinking without putting on weight, but on the whole they are a response to the housewife's desire for less work in the kitchen. As their incomes increase customers demand improvements in variety, service, and preparation.

The increase in the preparation of foodstuffs has caused a rise in marketing margins: this has happened at a time when farmers' prices have been

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falling, so that there has been a fall in the proportion of the retail price received by the farmer. The following table shows how the proportion has fallen in recent years, from 52 per cent in 1946 to 41 per cent in 1955. It is nevertheless higher than before the war and at roughly the same level as in the boom years of the inter-war period, which suggests that in the long run the increasing efficiency of marketing has offset its rising costs. The differences between commodities are also interesting—66 per cent for eggs and 29 per cent for fruit and vegetables.

Table 1
Farm-to-retail price spreads in America 1946–55¹

	Meat products	Dairy products	Poultry and eggs	Fruit and vegetables	All products	Average of all prices received by farmers 1910–14 = 100
1938	49	49	67 (a)	27	39	97
1946	73	57	70	37	52	236
1947	69	56	69	32	51	276
1949	64	50	68	31	46	250
1951	67	52	68	30	48	302
1953	61	49	69	29	45	258
1955	54	46	66	29	41	236

(a) Eggs only

The marketing margin—consisting largely of wages and transport costs—is comparatively rigid so that, in the short run, when farmers' prices fall the marketing margin represents a higher percentage of retail prices, and a lower percentage when farmers' prices rise. In other words, farmers' prices (apart from subsidies) fluctuate more sharply than retail prices.

Similar trends are not so easily discernible in Britain, largely because we have not the same precise information on the farmer's share of retail prices. Figures of the gross margin (the difference between purchase price and sale price) for various classes of wholesalers and retailers are available from the 1950 Census of Distribution, but even with this information which, of course, is seriously out of date, an accurate assessment of the total costs of distribution is not possible because the various categories of wholesalers and retailers do not exactly coincide.

Distribution costs in Britain

Such information as we have suggests that the costs of processing and distributing farm products are considerably lower in this country than in America, because many of our foods undergo less processing and have to travel shorter distances before they reach the housewife. The higher proportion of the retail price received by the British producer can be seen by comparing Table 2 with Table 1. The fact that the farmer's share of the retail price of fruit and vegetables in America is only half that received by our farmers does not mean that the American producer gets less than the British. American retail prices are higher, and the willingness of the American housewife to pay higher prices for frozen and prepared vegetables is of great

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advantage to the grower, for it widens the market for his products, and increases the total demand for them.

Table 2

U.K. producers' share of retail prices of some representative foods and other products^a

FOODS	Wholesaler per cent	Retailer per cent	Producer per cent
Carcass meat (estimate for fresh beef)	9	25	66
Milk	7	25	68
Fruit and vegetables	16	18	66
OTHER PRODUCTS			
Clothing	11	25	64
Hardware	14	27	59
Chemists' goods	15	31	54

It is noticeable in Table 2 that in Britain the margins of food distributors are generally lower than those of the distributors of other products, in spite of the perishable nature of most foodstuffs. The turnover is, of course, faster for these than for other products, but against this has to be set the extra work involved in their preparation for sale. It seems that for these important commodities two-thirds of the total price paid by the consumer goes to the farmer and one-third to the distributors.

Fruit and vegetables

The costs of marketing fruit and vegetables, according to the recent report of the Runciman committee,³ add approximately 50 per cent to the price received by the farmer. Of this, about one-half goes in wholesaling and one-half in retailing. The individual wholesaler receives only 10·7 per cent of his selling price, but the total wholesaling margin is greater than this because produce is usually handled by more than one wholesaler. These percentages represent the average over the year; since many retail greengrocers tend to charge a fixed absolute margin (for example, so many pence per pound) the percentage margin rises much higher when there is a glut and prices are low, and falls when prices are high.

Milk

The total margin in milk distribution is the same as that for fruit and vegetables, but the retailing margin accounts for over three-quarters of it. The average retail price of ordinary milk in 1957–58 was just over 7½d. per pint, or 5s. 3d. per gallon. Of this, 1s. 4d. went to the retailer and 4d. to the wholesaler, leaving the M.M.B. with 3s. 7d. per gallon for liquid milk. The lower receipts from manufacturing milk pulled down the average price received by the farmer to 3s. per gallon. Unlike the retail prices of other agricultural products, which are determined by the free market, the price of milk and the various margins paid to distributors are fixed by the Government. A system of "zoning" of retail milk rounds to cut costs was introduced

during the war; though it has since been abandoned, some of its effects have remained, and the pressure of rising costs on retail margins no doubt tends to encourage the rationalization of delivery routes. Milk retailing is probably more efficient now than before the war, but delivering milk to the housewife's doorstep is bound to be an expensive method of distribution. As an aid to fixing the retail margin, the Government carries out a survey of milk retailers' income and expenditure on rather similar lines to the Farm Management Survey, but it does not publish any of the results: it would be interesting to know more about the economics of milk distribution.

Meat

Information on the distributive margins for meat is scanty because of the absence of reliable published figures of retail prices. Estimates can be made, however, and as an example we can take the case of a bullock, and account for the difference between the price the farmer receives and the price the housewife pays. The standard price for fat cattle in 1957-58 was 156s. per live cwt, of which about 36s. was a subsidy payment. The average market price of a 10 cwt bullock would, therefore, be £60. The costs of slaughtering and wholesaling would come to about £6, but as these would be covered by the receipts from the sale of the hide, offal and other by-products, the retail butcher would buy the carcass for approximately the same price as the farmer received—£60. If the beast killed out at 54 per cent, the carcass would consist of two 300 lb sides costing £30 each, an average price of 2s. per pound. An estimate of retail prices and wastage based on an Isle of Man investigation⁴ suggests that receipts from each side would be about £40, giving a margin of £20 in all, that is to say 25 per cent of the retail price, which is what the journals of the meat trade usually quote as typical. Out of carcass meat and by-products sold for £90, therefore, the farmer would receive £60, or 66 per cent of the retail prices, the same percentage as in the case of milk and vegetables.

It is not known what costs are incurred by wholesale and retail butchers or what profits they make, but competition should keep costs down to the minimum. Competition in the wholesale meat trade has been increased by the intervention of a producer-controlled marketing organization (the Fatstock Marketing Corporation) which buys fatstock from the farmer and sells meat to the retail butcher. There is no similar intervention by producers in the retail meat trade or other branches of food retailing, although this is the obvious step for producers to take if they believe that retailers are making excessive profits.

In those branches of food retailing, mainly the grocery trade, in which commodities are sold under manufacturers' brand names, price competition is in some cases restricted by "resale price maintenance", under which the manufacturer prohibits the retailer from selling his goods at less than a certain price. Resale price maintenance is strongly supported by some sections of the retail trade, although in general it is viewed less favourably by the large multiple stores, whose main attraction is low prices. In spite of resale price maintenance, a number of large "supermarkets" are being set up in some towns: this seems likely to herald a period of changing methods and vigorous competition.

Beneficial trend

The trend towards more processing and preparing of foodstuffs will thus probably offset the tendency for marketing costs to fall with the introduction of large-scale self-service methods. We cannot say whether, as a result, the marketing margin will rise or fall, but it is quite possible that it will rise, and that the farmer's share of the retail price will fall slightly. However, in so far as this means that the housewife is prepared to pay more for the greater convenience of prepared foodstuffs, it is inevitable and beneficial and should not be to the disadvantage of farmers.

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Irrigation Demonstration

A RECORD number of farmers attended the Ministry of Agriculture's irrigation demonstration on the Welbeck estate, Worksop, Notts, on 31st July. Amongst a comprehensive range of equipment, a notable feature was the increased popularity of sprinkler and spray lines, as compared with some of the water guns operated in the past.

Mr. E. J. Winter, Director of the Ministry's Vegetable Research Station at Wellesbourne, Warwickshire, remarked that in irrigation, the great problems were to know how much to put on, and, of course, when to put it on. The governing factors were: sun, wind, temperature, and humidity. He felt it was expecting too much of farmers to expect them to apply the "Penman" formula themselves, and several schemes had been evolved with the object of helping them to interpret the situation. At Wellesbourne, they are developing a machine which would simulate conditions in the field and the action of the plant in utilizing available water.

Water does not have the same effect on all plants; different plants react differently. They are trying to ascertain at Wellesbourne at which stage crops suffer most from a shortage of water.

Professor Duckham pointed out that it sometimes occurs that rainfall is lowest at periods when the sun is at its greatest peak of energy for photosynthesis. This is the greatest growing period of the year, when grass is able to utilize all the water which can be made available to it.

If the period when the digestibility of grass is at its maximum could be lengthened, more milk could be produced at lower cost. This has been the experience at Reading, where their milk sales have been increased from below 300 gallons per acre of feed to more than 400.

Peter Roos

The Gilfachwyth Story

R. PHILLIPS, D.S.C.

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An excellent colour film entitled *Stori Gilfachwyth* has just been issued by the I.C.I. Film Unit, depicting the success story of a 70-acre dairy farm in Cardiganshire—an area of high rainfall, few hours of direct sunshine and of difficult harvesting seasons. It is on 16 mm Kodachrome; running time 29 minutes. Commentaries have been made in English and Welsh.

A STORY usually has a beginning and an end. It is difficult to say when exactly the Gilfachwyth story began, and it is impossible to forecast its end. It can be said, however, that its influence on farm management ideas has been far reaching.

The clue to the story is the tenant of this small farm—Mr. E. R. Evans, M.B.E. The farm is typical of many Cardiganshire holdings which lie between the unreclaimed uplands and the valley bottoms or coastal strip. Topographically, it can be described as undulating plateau land of hill and dale, or better still in Welsh as *Pant a Bryn*. A long line of family descent since 1850 has subscribed to the tenancy. Mr. Evans married into this family and, after the death of his father-in-law in 1930, became the occupier. Evans perhaps is not typical of the general run of small farmers in Wales, for he inherited some advantages. He had the good fortune to be the son of a born husbandman who taught him from childhood to regard the soil, the land, the crop and the animal with loving care. He also had the good fortune which allowed him to go from the village school for three or four years to the local secondary grammar school at Llandysul, there to widen his vocabulary and horizon, to deepen his vision and to learn something of the rudiments of science. Incidentally, he obtained a School Certificate and then returned home to work on the land, for jobs were scarce and many white-collared, black-coated workers were unemployed. We should remember that only a small proportion of the present-day farmers of Wales, large and small, have had the benefit of attending a grammar school or of pursuing a course at a Farm Institute. It may be this reason which underlies the fact that new ideas are slow to take root in farming. Beforehand there must be not mere experimental adventure but a reasonable assurance of financial success in any new project or purchase.

Evans also had the responsibility, whilst still a young man, of running his own farm and of earning his living on the land—an unusual opportunity on the family farm. But during the early 'thirties he also kept cost accounts for the Agricultural Economics Department of the University College of Wales, and had already acquired an insight into the study of financial accounts and the benefits that could be derived from them. This background to his career has probably had a considerable influence on the development of *Stori Gilfachwyth*. Obviously, we must not forget the Nonconformist upbringing which he received in early life. The film acknowledges the part played by religious practice in the rural districts of Wales to this day.



Gilfachwyth
Stacking oats.
Part of the milking herd.

Photos: I.C.

Arable Farming on the R... Marsh



Tile drains (usually laid by machinery) have made farming on the Marsh much more flexible.



Photos: Douglas Weaver.

Potatoes are an important crop financially, most of them being Majestics and King Edwards.

Marsh (Article on pp. 350-3)



Over 7,000 acres are under wheat, mainly Cappelle.



Photos: Douglas Weaver.

Four or five farms now grow tulips and daffodils for bulbs.



Photos: I.C.I. Ltd.

Gilfachwyth

Mr. E. R. Evans lifting silage from his pit. He makes 100-150 tons annually, from grass gathered by buck-rake.

The challenge

When in 1939 the Second World War came, with its ceaseless propaganda and exhortations for more production from the land, it was not at all easy for a farming community, 250 miles to the west of Whitehall, accustomed to produce surpluses that could not find a market, to grasp the dangers of starvation facing the millions of urban dwellers in this country.

Yet by 1942 the propaganda machine, operating through the W.A.E.C.s, had succeeded through farm walks, fireside chats and field demonstrations, in creating an enthusiasm and an urgency amongst farmers, to the extent that Evans and his neighbours had travelled over thirty miles to see and learn from a demonstration on silage-making and rotational grazing at Nantcellan College Farm. Here he realized how much more he and his neighbours could contribute to food production in those difficult times. He realized also that he alone, with his limited capacity, capital and knowledge, could not venture into this strange technical field without assistance. Accordingly, he asked for help from the technical officers of the W.A.E.C., who in those days of close and active co-operation between the colleges and the counties, introduced his problem to the University College authorities. By good fortune, a team of three members of the staff, economist, plant breeder and agriculturist, had been acting together on farm demonstrations and on certain farming difficulties, and it was this team which visited Gilfachwyth in April 1943.

We should like to think that that was the occasion when the Gilfachwyth story began. Actually, it was many years earlier. The tenant, as my memory serves me, was then a shy, quiet young man, probably somewhat awed and certainly afraid of showing his farm to "experts". He told us that he, his wife and farm staff were working too hard for too little return and he asked us to advise him how to produce more and earn a better living from the farm.

This was a new and a very tall order, and we were not too sure how to proceed. Evans's accounts showed that there was practically no difference between receipts and expenditure, and therefore we had to aim both at increased production and lower costs. At that time all costs were rising at an alarming rate, and it was well-nigh impossible to improve the efficiency. Accordingly, the plan devised was to secure a vastly increased production of milk from the land. There was an increasing demand and a rising price for milk, and the plan would comply with the W.A.E.C.'s ploughing policy and compulsory cropping programme.

New plan based on milk

The decision was to zone this farm of twenty small fields into three compartments. The inner circle of 25 acres around the homestead was apportioned into eight paddocks for rotational grazing—the mainstay of the dairy herd for a lengthened grazing season. The outer circle of about 35 acres of arable land was to be run on a five-course rotation, corn—roots—corn—hay—hay, so that 21 acres would be in tillage. This would provide fodder for the stock during the winter, besides some cash crop or other. The third zone was of about 10 acres in permanent grass on the steeper slopes and inaccessible places, which would carry the young stock of followers. This piece of land was a boon, for it allowed elasticity in management.

THE GILFACHWYTH STORY

The division of acreages had been arrived at by simple calculations of relating grass and crop yields to the stock requirements for maintenance and production. It is surprising that over a period of years those estimates and calculations have been found to be so near the mark. The experience at Nantcellan since 1929 had shown that intensive manuring and methodical grazing had resulted in a greatly increased stocking and milk output, without changing the kind of stock. Gilfachwyth, however, went a step further, for it demanded a reduction in the number of horses and getting rid of the sheep to make room for as many cattle as possible, mainly milking cows, as well as followers. We estimated that the farm could carry a herd of 30 cows and their followers. This was hardly believable, for in 1943 Mr. Evans's herd consisted of only 13 cows! In time, to his credit, he volunteered to carry out the plan and to follow the programme to the best of his ability.

Threefold production

The film of *Stori Gilfachwyth* cannot give full credit to the struggle of 1943-45 to get the plan into action. The success in getting grass seeds sown in a crop of wheat standing over a foot high in May 1943 was miraculous, whilst the cutting of a crop of oats in the green state for hay in July, so as to grow rape for autumn grazing, can only be described as an act of faith. It is true that in this moist and humid climate there is no difficulty about seeding land down to grass, direct or under a nurse crop, at any time from April to the end of August. The new swards at Gilfachwyth lived up to the exalted reputation of the "S" strains for summer milk production. Equally reliable were the results from the "S" varieties of oats and the various types of kale. Milk output per acre and per cow, and the monthly cheque, rose steadily from month to month and year to year. Comparisons of the statistics for 1944 and 1956 relating to this small dairy farm were given in a N.A.A.S. brochure at the Ministry of Agriculture's demonstration at the Royal Welsh Agricultural Show in 1957. Briefly, these can be tabulated as follows:

	Total cattle	Cows	Total milk production	Gross output	Net farm income
1944	31	15	6,750 gal	£1,260	£260
1956	52	26	18,500 gal	£4,310	£1,410

Continued success and perseverance with the plan are an indication of the soundness of the financial/technical relationships, but much more are they a tribute to the character of Mr. Evans. He is never daunted and overrides neighbourly leg-pulling with ease. By his planning he has learned a great deal technically concerning his farming, and he has an increase in his annual income to show for it. The contacts he has made with visitors—and many come long distances to see his work—together with accumulating experience on the platform and on the air, have developed an ever richer personality. More than anything else perhaps, this has given a great deal of satisfaction to his early mentors from the College.

A few routine changes

Naturally, modifications have been made in the routine from time to time,

THE GILFACHWYTH STORY

but the original plan in essence remains to this day. There have, for example, been changes in the manuring: the dosage of nitrogen has increased, and the use of potash fertilizers has shown that clovers can be kept in abundance in a pasture receiving appreciable amounts of nitrogen in a season. The change-over from hay to silage follows modern advice, and the replacing of the stemmy kales by Canson's strains has followed modern trends. The seeds mixtures for leys have been modified, so that nowadays timothy/fescue/S.100 leys are the really important ones, having replaced the ryegrass/cock's-foot types. Again, the growing of seed potatoes of the early varieties has aimed at taking advantage of the market in south-west Pembrokeshire. In all this work on the land, the art of thorough cultivation in tillage operations remains well-nigh perfect, despite the temptation of modern tractors to hurry the work and ease the burden without the accustomed thoroughness.

In controlling the pastures, the electric fence for strip grazing has come within the original paddock grazing practice, whilst polythene tubing and a movable water trough are further additions to efficiency. The progress in the improvement of the stock is not quite so pronounced.

The film shows that Mr. Evans has become a public figure in his locality, graduating through leadership in the Young Farmers' Club to become a member of the R.D.C. The farm has been adopted by the Association of Agriculture for its School Adoption Scheme, and it is Mr. Evans's task to write to the distant schools regularly and to show the pupils round the farm on their periodical visits.

Stori Gilfachwyth has made a film which every farmer will wish to see. It was photographed by Mr. Leslie Scholefield at various times throughout the year, and consequently it is rich in beautiful shots of coloured hedgerows and painted machines as well as men at work on the varied farming operations that take place throughout the seasons. But above all, it is a portrait of a man and his farm in complete accord when a job has been well done.

Applications for free loan of this film should be made to Imperial Chemical Industries Ltd., Central Agricultural Control, Imperial Chemical House, Millbank, London, S.W.1 (Tel. VICToria 4444).

Arable Farming on Romney Marsh

C. F. BLUNT, B.Sc.

National Agricultural Advisory Service, Kent

Romney Marsh and fattening sheep have become synonymous terms. But now, under modern conditions of farming, an appreciable area of arable, mainly under wheat and potatoes, is emerging.

ROMNEY MARSH is renowned throughout the world for its fattening pastures: it conjures up a picture of rich grassland, thickly populated with sheep of the famous local breed. It may come as a surprise to some that about one-third of the total Marsh area is now in arable crops. The Marsh, taken to include all the land confined by the Royal Military Canal to the north and the river Rother to the west, was reclaimed from the sea over a period of several hundred years, this reclamation being hastened by building up banks of soil to contain the sea. The result is some 50,000 acres of fertile agricultural land, most of which lies only a few feet above sea level. The greater part of this land is in Kent, but about 8,000 acres spread over into East Sussex. Looking down over the Marsh from the higher ground to the north, one sees a flat, low-lying and open countryside with winding roads, very few trees and hardly a hedge. It is intersected by dykes which drain the area and also act as fences for the stock. The dykes drain either into the Canal or into larger drainage channels, known locally as "sewers".

The alluvial soil has an extremely high natural fertility and very heavy crops are grown; wheat sometimes reaches 3 tons per acre, and one or two crops of potatoes have made 18 tons per acre. No land is uniform, however, and even over this relatively small area the soil varies from light sand in the Lydd and New Romney area to heavy loam in the extreme north-east. The level of potash is high throughout, whereas phosphate tends to be low and varies considerably. A chalk lorry is an uncommon sight on the Marsh since, apart from a few small pockets, there is a good deal of natural lime in the soil. This factor, coupled with a high water-table and a rich supply of organic matter, often gives rise to trace-element deficiencies, which are peculiar to such areas. These deficiencies should not be over-emphasized, however, and are mainly confined to manganese and possibly boron, although some copper deficiency is noticeable amongst stock. High fertility goes hand in hand with a great depth of soil, and it is quite usual to plough 12-14 inches deep.

Swing to arable farming

Although there was some tillage, even in the last century, it was not until the last war and the consequent ploughing-up campaign, that any considerable acreage of arable crops was grown. By 1944 the arable acreage was almost twice as much as it had ever been before, and although there has been a slight decline since the war ended, there are now about 17,000 acres of arable land. Farmers have now realized the immense value of this land under cash cropping, and with the influx of a few Lincolnshire farmers who specialize in this type of farming, it is likely that the acreage under the plough will be maintained.

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In view of the profitability of cash crops, it is rather strange that the tillage acreage has not increased even more. This can be attributed only to the fact that the farmers are traditionally graziers. In addition, some of the holdings are rather small and not equipped for arable farming. A number of farmers live away from their farms, occasionally off the Marsh altogether, and it is fairly common for a man to farm land dotted about the Marsh. Some of these blocks of land are without a dwelling of any kind.

The importance of the part which drainage has played in the change to arable farming cannot be over-stressed. Much of the arable land has now been tile-drained, usually to a depth of about 3 feet, and occasionally pumps have had to be installed to get the water away from the lower areas. Many fields still show signs of poor drainage, however, and some land is liable to flooding. There are a few farmers, in fact, who believe that for maximum yields nearly all the land on the Marsh should be tile-drained, whether it shows signs of poor drainage or not. This has led to some conflict between the old type of grazier, who wants a high water-table in summer, and the more recent arable man.

To put it briefly, drainage has enabled the Marsh farmer to practise a more flexible system of husbandry, in contrast to the old, rather static system. Whereas spring cropping was once the rule on certain land, drainage has meant that autumn sowing can now be carried out, and in any case the increase in yields must be substantial.

Wheat and potatoes

By far the most widely grown crop is wheat, of which there is over 7,000 acres. Most of this is autumn-sown Cappelle, with a small acreage of Hybrid 46. Atle is still the main spring wheat, Marsh farmers being traditionally suspicious of newer varieties until they have been proved. Barley has increased considerably with the coming of the stiffer-strawed varieties. Proctor is widely grown, and yields have often been little short of those of wheat; 35–40 cwt per acre is not uncommon. Oats are of minor importance because of their relatively poor yield on this class of land, and almost all the spring oats are S.225, as other varieties tend to lodge badly.

Very little fertilizer is applied to cereals; with the first cereal crop in the rotation the general rule is to apply none at all, apart possibly from a top dressing of nitrogen. Trials have been carried out on winter wheat over three successive years by the N.A.A.S. in conjunction with the N.I.A.B. These showed that 1½ and 3 cwt per acre of "Nitro-Chalk" gave no response whatsoever, but they were carried out on the better Marsh soil. Two of the wheat crops were after potatoes which had been well fertilized, and the third was after peas. The trials indicate that there is little point in top-dressing a crop of winter wheat on the better soils of the Marsh unless it is the second or third cereal crop. It is common practice to graze most of the winter wheat in the spring. Indeed, grazing is relied upon to provide keep for the sheep at this season of the year, as grass is often slow to come away. Provided grazing is completed by the first or second week in April, the wheat yield on this fertile Marsh is not likely to be affected, but many farmers graze considerably later than this.

Potatoes are a most important crop financially. Most of these are Majestics

ARABLE FARMING ON ROMNEY MARSH

and King Edwards, the latter variety being well suited to this soil and often yielding 12–13 tons per acre. The Marsh is not particularly good for early potato growing, since it is subject to late frosts and biting winds. But several hundred acres are grown on the lighter land, and near Lydd some of these crops appear to enjoy a degree of protection by virtue of their proximity to the sea. Lifting starts about mid-June, and second earlies (mainly Arran Pilots) are harvested in late July and August. In contrast with cereals, potatoes demand and receive a generous application of fertilizer—usually 10–12 cwt per acre of a potato compound. In view of the high level of potash in the soil, farmers would be well advised to examine the possibility of using a compound with a lower percentage of potash. The same argument might well apply to peas, which are grown extensively for harvesting as dried peas for processing. A canning factory has recently been set up locally; this may well lead to an increase in the acreage of peas grown for canning, which at the moment take second place to harvest and seed peas.

Crops grown for livestock include beans and mangolds, the former being a favourite feed for the ewes. Yields of mangolds are heavy, and sometimes reach 50 tons per acre. There is no sugar beet factory in this corner of England and sugar beet is grown only on a limited scale. The area seems well suited to the growing of Aberystwyth strains of timothy, cocksfoot and meadow fescue for seed, and these crops are often used to prolong the arable rotation. Aberystwyth strains of ryegrass and white clover are not grown, as they would cross with the local Kent perennial ryegrass and wild white clover, which are taken for seed from the pastures. The remaining crops are specialized and not widely grown: they include a declining acreage of turnips, swedes, mangolds and red beet—all grown for seed, the Marsh area being traditionally a producer of seed even in the days when there was comparatively little arable. Tulips and daffodils are grown for bulbs, and the acreage given over to them now runs just into the hundreds but is confined to only four or five farms. The flowers are seldom sold, the heads usually being picked off by hand to prevent seed formation and so increase bulb size.

Overcoming pests and diseases

It would be difficult to say what system of rotation is followed on the Marsh; an odd field is occasionally found which is still producing useful crops after thirty years of continuous arable. A reasonable interval is generally allowed, however, before repeating a crop, and in spite of the tendency to grow wheat as often as possible, the incidence of take-all is not high.

As would be expected in a potato-growing area, potato root eelworm is one of the greatest sources of anxiety, but it has not assumed serious proportions and is only really of any consequence on the lighter land around Lydd and New Romney, where it is difficult to resist the temptation to grow potatoes too frequently. Growers are very much alive to the dangers and have been most determined in their efforts to keep the pest under control.

Blight is fairly prevalent, and spraying is nearly always carried out by land machine in spite of the fact that the open nature of the country would appear to give every opportunity for aerial spraying.

Manganese deficiency, which has already been mentioned, very often gives rise to the disorder in peas known as marsh spot. This is overcome by spray-

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ing with 5 lb of manganese sulphate per acre, usually incorporated in a DDT spray, during flowering. The DDT is often used against aphids, but is more commonly used to control maggot in peas, as attacks of pea moth can be very serious in this area. As far as is known, pea root eelworm is non-existent, but in the last two or three years several outbreaks of *Fusarium* wilt have occurred. This disease was particularly serious in 1956 and 1957 when Rondo peas were in favour. This year nearly all the dried peas are Harrison's Glory, and this variety appears to be resistant.

Equipment must keep pace with developments

The comparatively recent increase in arable acreage could not have been attempted without a corresponding increase in the equipment required for this type of farming. The pea viners, grain drying and storage plants which have been erected on the larger farms seem almost to intrude upon a countryside formerly so devoid of buildings. In many directions progress has still to be made, but the number of potato-chitting houses is slowly increasing and irrigation is now coming into use, taking water from the Marsh dykes. In-sack driers have been installed on the smaller farms to cope with their much bigger harvests. Not least important is the need for improved farm roads to give better access to the more isolated land and buildings.

A really calm day is rare on the Marsh. Because of this, spraying always presents problems, and the treatment of cereals is often delayed, leaving wheel marks visible late in the season. High volume sprayers are needed in many instances and are probably more often seen than low volume machines.

There is a good deal of heavy equipment about, crawler tractors being in evidence on all but the lighter soils. Work is streamlined as much as possible, peas and herbage seed crops being grown in 18-inch rows so that standardized equipment can be used. Bulbs also fit into the system well, since they are grown in the same width rows as potatoes and harvested by the same machinery. Potato planting, however, is often done by hand, the labour problem being met mainly by bringing temporary workers from the larger towns outside the Marsh.

Travelling through Romney Marsh, one can see that there is room for further improvement—many poor and rush-covered pastures lack the drainage which would enable them to produce heavy crops of wheat or potatoes. Yet in spite of the continuing changes made by intensive agricultural and drainage operations, the Marsh still retains special peculiarities: dykes used as fences as well as for drainage, and now for irrigation; a highly fertile soil producing heavy crops but giving rise to mineral deficiencies; and pasture supporting twice the normal number of sheep, though only the Kent breed appears to thrive. These and many other idiosyncrasies combine to create the unique character which makes Romney Marsh an area of compelling interest.

An article by R. Duncan, County Advisory Officer, N.A.A.S. Kent, discussing the subject of sheep on Romney Marsh, appeared in the Summer issue of the *N.A.A.S. Quarterly Review*.

Eradicating Foot Rot

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Sheep flocks can be cleared of foot rot by a simple, if tedious, routine.

It is a widely held belief that foot rot is inevitable, particularly in flocks kept on wet land. Nothing could be further from the truth. It has been known for the last twenty years that not only can the disease be eradicated from a flock, but, provided no infected sheep are brought in, the flock can remain free from this trouble indefinitely. Its clearance from a flock is based on three well-established facts:

1. Foot rot is caused by a germ which affects only sheep (and goats). This germ enters the foot through the skin between the clays. Wet weather, by softening the skin, makes it easier for the germ to enter, but damp conditions alone cannot cause foot rot.
2. The germ cannot survive in the soil for more than about a fortnight. Pastures that have not carried sheep during the past two weeks are therefore as safe as those that have not carried sheep for years.
3. *Provided the foot is well pared*, the germ is easily killed by any one of a variety of medicaments. Probably the best of these is a 10 per cent solution of formalin.*

A laborious but simple job

The first task—and it is a task—is to turn up every sheep in the flock and examine every foot. Infected sheep are treated (see below) and given a temporary mark. Healthy sheep simply have the foot trimmed to shape in the usual manner. All the sheep, whether infected or healthy, are put through a foot-bath containing a 10 per cent solution of formalin, and it is important to see that each sheep is in the bath for not less than one minute. From the foot-bath the sheep must go straight into a pen with a clean, dry floor. This floor must be kept clean and dry by frequent sweeping; if straw is used to floor the pen, it must be renewed frequently. After standing in this pen long enough to allow the formalin to dry on the foot (not less than one hour) the sheep are released to pasture. If a "clean" field—that is, one that has not carried sheep for at least a fortnight—is available, so much the better, but this is not essential; neither is it necessary at this stage to separate the infected animals from the healthy.

Treatment of an infected foot means removing not only the overgrown part of the foot, but also all the horn that has become separated from the underlying sensitive flesh. This is a difficult and delicate operation, calling for a steady hand and a sharp knife. If possible the operator should have an assistant to hold the sheep so that he can tackle the foot from any angle, and

* Formalin is the name commonly given to a 40 per cent solution of formaldehyde. It can be obtained from any agricultural chemist. Dilute with nine parts of water to give a 10 per cent solution.

ERADICATING FOOT ROT

so can remove all the separated hoof without injury to the flesh. Injury to the foot should be avoided because not only does it cause unnecessary pain, but the bleeding makes it impossible to see what one is doing and usually results in the foot being insufficiently pared and failing to heal.

After paring, the foot is held in a small tin containing 10 per cent formalin. As this is exactly the same as the solution used in the foot-bath, it may be wondered why it is necessary to treat infected feet individually. The reason is that after having its foot pared, the sheep will generally try to carry that leg and as a result may not put the foot down in the foot-bath at all.

Subsequent examinations

About one week later, the flock is brought in for examination, and again every sheep is turned up. (It is only too easy to miss an early case during the exhausting process of examining the whole flock on the first occasion.) Particular attention should be paid to those that were marked as having been infected at the first examination. Any of these which are still infected (perhaps 10-20 per cent of those originally infected) are re-treated, and given a fresh mark. Any new cases should, of course, also be treated and marked. Every sheep, whether infected or healthy, must go through the 10 per cent formalin foot-bath and stand in a dry pen for at least one hour, as before.

Another week later (that is, a fortnight after the start of eradication) the flock is brought in again. This time only the marked sheep are turned up. Any infected animals are re-treated and re-marked as before. Again, every sheep must go through the foot-bath.

A week after this, the flock should be brought in for the fourth time. The procedure is the same as in the previous week, only the marked sheep being examined but all going through the foot-bath. By now, the number of animals still infected will probably be very small. If a few cases do still exist, it is probably best at this stage to separate them from the rest of the flock, both for convenience of re-examination and to avoid the risk of spreading infection. If the infected sheep have to be left with the main flock, weekly examination of these infected cases and foot-bathing of the whole flock will have to be continued until all appear to have been cured. If the infected cases are isolated and the main flock placed, if possible, on clean land, only these few infected sheep need then be examined. When the last of these appears to have been cured, or has been disposed of (it is generally better to dispose of cases that have persisted in spite of three or four treatments, since they may become carriers) the flock may be considered provisionally to be free from foot rot.

It can happen, however, that an apparently healed foot may break down again some time later. In very dry conditions, this may not happen for several months, but in British conditions it is rare for a breakdown to be delayed for more than a few weeks. To guard against this, it is necessary to carry out a final examination of the whole flock not less than one month after the last case appears to have been cured. This means turning up every animal again. If no case of infection is found it may be assumed that the disease has been eradicated. If an infected, or even a doubtful, case is found, the animal should be isolated and the whole flock examined again not later than one month after this animal has been cured or disposed of.

But it is well worth while

From what has been said it will be seen that eradicating foot rot from a flock of any size is a tedious and therefore an expensive matter. Actual costs in a recent series of trials which I carried out were estimated (on the assumption that the skilled work would be done by the owner or shepherd) at between 1s. 7d. and 3s. 3d. per head for skilled labour and formalin. Unskilled assistance must be provided in addition to this. Is it worth it? Figures for losses in adult sheep are very hard to obtain, but no flockmaster would deny that ewes suffering from foot rot give a poorer yield of milk and wool than do unaffected sheep.

In lambs fattening on roots, the loss caused by foot rot, in spite of treatment, has been found to be 9s. 4d. per head over a period of 8½ weeks.* As for young breeding stock, several experienced flockmasters whose sheep are at present free from foot rot have told me that they would be prepared to pay an extra 10s.-20s. for gimmers that could be guaranteed free from this disease.

When one remembers that the cost of eradication occurs only once, whereas the benefits are seen every year, there is little doubt that it is an economic proposition in any breeding flock. Even in flying flocks, it is worth doing, particularly on the type of land where foot rot is known to spread rapidly.

Foot rot is one of the few remaining diseases that can be prevented by the farmer himself. If all sheep-owners would make the necessary effort, foot rot would soon be a thing of the past.

* Sheep Fattening on Swedes. T. E. HUNT. *Agriculture*, 1958, 64, 561-3.

Devon Swedes

WILFRED C. IBBETT, N.D.H.

National Agricultural Advisory Service, Devon

Careful cultivation and regulated marketing brings a steady and increasing demand for small, high-quality Devon swedes.

SWEDES (half bag 56 lb) 4s.-6s.: Devon Swedes (half bag 56 lb) 6s.-7s. Thus runs the market report in front of me. Why is there this difference between Devon swedes and those grown elsewhere? Is it because there is a difference in quality? Are Devon swedes better flavoured, are they more suitably graded, have they become better known on the markets, are they different varieties? It is not easy to give a definite answer to these questions, but there is little doubt that swedes of the right varieties grown on the red soils of Devon are superior in flavour to similar varieties grown on other soils. Moreover, the system of marketing by merchants, peculiar to Devon, ensures regular supplies of well-graded roots reaching the markets from September to April. Probably these two factors have most influence on prices. Even at the beginning of the season, when swedes make the most money, there is still this difference in price; in fact it is usually accentuated, ordinary swedes making 6s.-8s. per $\frac{1}{2}$ cwt and those off Devon red soils 8s.-10s. per $\frac{1}{2}$ cwt.

It is only on the red sandstone soils that swedes for human consumption are normally grown. The heavier types are preferred, on account of their relative freedom from "club" and less likelihood of mildew. In Devon, these red soils extend along the coast from Paignton to Exeter, running inland to a depth of three miles. There is also an area around Exeter, stretching from the coast at Budleigh to Cullompton and a little beyond, and there is the long, narrow strip from Crediton to Hatherleigh on which some swedes are grown.

The acreage is increasing and more interest is being taken in producing better samples, as well as in improved methods of cultivation. Nearly all the swedes for human consumption are grown on farms. The crop does not appear to be at all popular with market gardeners.

Only a few kinds are really suitable for the "dessert" trade. To be readily accepted by the markets, the roots must not be too large. Those weighing about 2 lb each are ideal, but buyers generally will accept roots a little larger, within a range of 3-5½ inches in diameter. The roots should be neat and compact, with small necks, fine skins and a good colour. They must be relatively frost resistant, and should not grow too large if left in the field until the spring. Only purple-topped varieties are wanted.

Unfortunately no suitable varieties have been grown that are resistant to all the known races of "club root". Varieties such as Wilhelmsburger are highly resistant, but are green topped and not therefore acceptable to buyers. The most popular varieties in Devon are Acme, Devon Champion, Doon Major, Danestone, King of the West, and Kelvedon Advance. Acme is probably the most widely grown. It has a small neck and fine skin, and is of a uniform size. Doon Major is a very heavy-yielding variety, but is not so

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frost resistant as Acme. Devon Champion produces good, well-shaped roots which resist frost. Danestone is a good cropper, with a small top, but with a larger neck than some varieties. King of the West is an old variety, but still grown. Kelvedon Advance is a newer kind, which is gaining favour with some growers; it has a short neck and does well almost everywhere.

Careful cultivation

When growing swedes for human consumption, it is customary to take rather more care over the preparation of the seedbed. Clean land is important and the necessary steps are taken to rid the land of weeds that would compete with the crop in its young stage. The roots are often grown between two straw crops, and not more than once in four years on the same land. They may also follow a ley.

Where the land is to be dunged in the spring, it is ploughed as deeply as possible in autumn, to bury weed seeds and improve drainage. In spring, the land is ploughed again to turn in the dung early enough to allow a further period of weathering. The furrows are worked down as soon as the land is dry enough, and as many "crops" of weeds as possible germinated and killed before sowing time. A fine seedbed is obtained by a series of harrowings and rollings, and for this type of swede it is customary to use flat rather than ring rollers. The importance of working the soil when in the right condition is fully recognized by the best growers, who try to get the most favourable seedbed possible. It is usual in Devon to sow on the flat, and not on ridges.

Some growers use up to 15 tons of dung per acre, and a compound containing 5 per cent N, 12 per cent P_2O_5 , and 12 per cent K_2O at 5 cwt per acre. Others on good land use less nitrogen or none at all, so as to keep down the size of root. Where boron deficiency occurs, it is usual to apply boronated compounds. Most growers understand the importance of phosphates, and apply super or basic slag, according to the type of land.

Sowing dates are fairly consistent. Midsummer Day is a popular date, but some growers who wish to cater for the early market in September, when prices are highest, sow earlier than this. A few sow later, but none after 12th July. The later sowings seem to be less affected by mildew.

Seeding rates vary, but generally 2-3 lb per acre is used. Some growers use drills with half the cups blocked, getting down to as little as 1 lb per acre.

Recently, precision drilling has been introduced. By using precision drills, swedes can be sown at 3-inch and 6-inch spacings, the plants being chopped out at 6 inches, which is about the right spacing for swedes for human consumption. Possibly, by using graded and gravity-separated seeds, with a germination of 90-95 per cent, a 6-inch spacing could be used, obviating the necessity for any chopping out. At present, however, growers seem to think this is too risky. In practice (probably owing to wheel slip), the 6-inch spacing on the belt becomes 7-inch in the field. Also, stones may cause gaps. The rows are usually 20-22 inches apart, and it is important, if the full advantages of precision drilling are to be obtained, that the rows should be perfectly straight. Precision hoeing can then also be carried out, with the hoes right up to the seedling plants. This can be achieved by careful, slow

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drilling at about 2-2½ miles per hour. If the four-unit drills are matched up with suitable hoes, very little hand-hoeing will be needed, and the amount of hand labour required for thinning will be reduced by as much as 25 per cent. It would seem, too, that just the right spacings can be obtained, which may mean an increase of crop from the 15-20 tons per acre aimed at, to 20-25 tons, with no difference in the weight of individual roots. With precision drilling, the plant population is so small that adequate protection must be given against flea-beetle. A few growers use BHC dusts when the rows show, but the majority are now using dressed seed. It is still wise, however, to dust the dressed seed if a really bad attack develops.

Precision drilling will substantially reduce labour costs, but the drills are expensive. A four-unit drill costs as much as £120. Moreover, ideal seedbed conditions are essential. Nevertheless, where the acreage warrants it, I think precision drills are a worthwhile investment.

It is usual after seeding to harrow the seedbed, though some growers maintain that singling is more difficult where the land has been harrowed. Mechanical gappers and thinners have not been used in Devon for this class of swede, and thinning is done by hand. Mechanical hoeing, or scuffing, starts as soon as the rows are seen, or earlier if a steerage fin is used on the seeder unit. Hoeing is continued until the foliage makes this no longer possible.

Marketing to match demand

As already mentioned, one of the main reasons for the popularity of Devon red soil swedes on the markets is that regular supplies of suitably sized roots of the right varieties are available throughout the season. Marketing is regulated according to demand, and it is not usual for any particular market to be glutted or for shortages to occur.

Nearly all the marketing is done by specialist organizations or by individual dealers. The farmer grows the crop and sells it in the growing stage to a marketing organization or to a dealer who buys the crop at so much an acre. One organization, which is run by a small group of hotel proprietors who supplement their hotel takings in summer by what is locally termed "swede bashing" in winter, buy and market some 500 acres a season. Other organizations and a few dealers buy almost all the remainder. Very few farmers market direct.

This system is very convenient to the farmer who, in any case, would not have the labour to harvest the crop, except perhaps in very small quantities. By selling the standing crop to a dealer, the field can be cleared quickly, so enabling him to get on with his subsequent cultivations as soon as weather permits. Moreover, he does not have to worry about where to send his swedes or to keep up regular supplies. The merchants or dealers are expert in assessing yields and know exactly what the market wants. The usual method is for the buyer to value the crop and make an offer. When accepted, lifting can begin, but it is not usual to lift before the middle of September. Prices at this time of year are high, probably higher than at any other time, except when vegetables generally are very short, but the demand early in the season is small, and crops are much lighter than later in the season.

The crops are lifted by hand, as careful handling is necessary for market

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swedes. Three good men will lift and top, clean off roots, put in bags and weigh, some 5 tons per day. The men are supplied by the buyer, the farmer providing only a tractor and driver to take the produce to the nearest hard road. Whilst no precise grading is carried out, small roots are thrown out and very large ones put aside. It is the normal practice to clear a field and send off the produce direct to a market. Very little clamping is done. The buyers endeavour to get the roots to the market in a clean, fresh condition, and they have undoubtedly done much in the past few years to improve and maintain a high standard of produce. Most of the swedes are sent by road to the markets, principally London, Southampton, Liverpool, Cardiff, Swansea, Leeds, Manchester, Birmingham and the bigger south coast resorts. Large roots (those over 5 inches in diameter) are sent regularly to Liverpool and Southampton, specially for the shipping trade, which does not mind large roots.

Devon swedes are marketed from the middle of September until April, but the demand is greatest during December, January and February. During very cold, frosty spells, the demand increases and prices rise, but usually prices remain reasonably steady throughout the season.

Despite competition from quick-frozen and canned vegetables, swedes continue to be popular and, if anything, are increasing in popularity. Certainly more swedes for human consumption are being grown in Devon.

Management Analysis on a Small Farm

IVOR W. JONES, B.Sc.

National Agricultural Advisory Service, Caernarvonshire

How the net income of a small farm was increased from £25 to £29 an acre in three years, although only minor changes in methods of production were possible.

IN 1954 a small tenant farmer asked for advice to determine the value of his individual livestock enterprises. He had taken over 25 acres of mediocre land in 1949 and had built upon it a herd of 9 cows and followers with an accredited poultry unit. A few pigs bought in as weaners were fattened. The question became one of choosing the best policy to meet the present trend of prices in milk, pigs and poultry, upon which so many small farmers depend.

A first look at the available accounts showed that the figures were not complete enough to make an analysis, and arrangements were made to take a valuation and start accurate book-keeping from 30th September 1954. This date gave ample time to consider field programmes for 1955. The farm is very small. Seven acres of the better land have no water supply and are more than a quarter of a mile away from the homestead beyond a main road. A further 5 acres of unploughable meadow land can be used only for grazing. The remainder of the land is sandy, but is conveniently near the homestead.

MANAGEMENT ANALYSIS ON A SMALL FARM

The continued rise in costs of feedingstuffs from 1949 to 1953, amounting to 4d. per 4 lb of dairy cake, was causing concern. The fertility of the farm had been greatly improved soon after occupation by applications of lime and phosphates. Normally 6–7 acres of corn and about 1½ acres of roots were grown, with 7–8 acres of hay and 9–10 acres of pasture.

Four-course rotation

Many development plans were considered before it was finally decided to keep the detached portion as an arable and hay block, to avoid taking the cows over a busy road during the summer. The cropping was to be corn and Italian ryegrass followed by roots, then oats and seeds and finally a three-year ley. This course was adopted as the farmer can readily grow good root crops, and favours them. The roadways preclude silage-making, as they are too narrow for the buckrake. This rotation also avoided a drastic change from the old programme, and now gives sufficient straw for the use of the farm, and enough grain to rear the pullets. It also gives a production ration, when balanced, for one gallon per cow per day for the winter and early spring. At least 4 tons of corn is expected from 2½ acres. The straw supplements the maintenance ration, reducing the area for hay.

The meadow land was earmarked for grazing; it had no other use. The fields by the homestead were also allocated for grazing, with a rotation of 2½ acres midseason kale followed by oats and seeds for grazing and a three-year ley, mainly for grazing. The new rotations could not be adopted immediately, but were in full action by the 1956 and 1957 cropping seasons. The use of oats for grazing fills a need in late May each year, when the grass on the treated leys is growing too rank. It also provides grazing to allow recovery of pastures grazed previously. The kale extends the grazing season to the end of January, and the direct reseeding that follows fills the gap during the summer drought and provides a strong ley for early bite.

Feeding the cattle

To acclimatize the cows to wintry weather, swedes and mangolds are fed out of doors during February and March, so that the animals derive full benefit from early bite about the first week in April. An electric fence was recommended and bought, and at the same time there was a general increase in the use of fertilizers. Ley mixtures are varied to even out production and palatability of herbage.

The cows are rationed strictly according to yield, and the winter feeding period is divided into two parts. During the first, from mid-November to late January, kale is expected to provide for the first gallon per cow, balanced home-grown cereal for the second, and dairy cake at 4 lb per gallon for each subsequent gallon. During the second period, from February to early April, balanced home-grown cereal is used to produce the first gallon and dairy cake the remaining gallons.

When early bite becomes available it is used strictly as a production part of the ration, and cake feeding is drastically reduced. When there is enough grass to allow full-time grazing, cake feeding is discontinued, except for a

MANAGEMENT ANALYSIS ON A SMALL FARM

wide cereal to protein ration for cows giving over 4 gallons a day. Some cows give 1,000 gallons and more a year.

Herd replacements are reared because no more ties for milking cows can be provided. Heifers calve at two years. The very limited farm buildings are a difficult problem. There are ties for 10 cows in three small converted sheds, and until recently ties for 6 small stores in another: these and a galvanized iron shed for calves were the only accommodation for cattle. The tractor shed has now been converted to accommodate heifers, and the calf shed converted to house two cows. A tarpaulin cover has been bought to protect the tractor. There are two small pigsties on the farm, but they are quite near the back door of the house and can be used only in cold weather. Huts for 250 hens on free range, and others for rearing pullets, were already in hand.

Accounts for the first season showed a fairly successful enterprise, but when costs were allocated to the respective departments it was found that the poultry section had actually lost £48, without taking into account the labour involved. A defect in this department had been suspected during the year 1954-55 and, to improve output, hens of another breed which would give a longer hatching season were bought. The number of hens was reduced from 250 to 150, allowing them more shelter in the winter. Earlier hatching was practised, to provide pullets that would lay in September before the hatching season really starts and when prices are good.

More milk sold: poultry begin to pay

The second season opened with a deficiency to be made up on the poultry side and with ten cows instead of nine. It was estimated that there would be enough fodder for the extra cow, but any deficiency could be covered by buying hay. However, luck was not running the right way. All the cows developed husk and lost much of their condition, and one aborted from the effect of continual coughing. This frustrated the plans to keep down the bought feed bill, as fairly heavy cake feeding had to be resorted to before the winter feeding period began. Even then the accounts for the year showed an increased yield of milk per acre, and an increase in the sales of milk per cow. The poultry section made a margin of £142 (without labour costs) which was quite favourable. The pigs showed a much smaller margin of about £35 without labour costs, which was about 30s. per pig. The profits for the year were reduced because of heavy expenditure on machinery.

The third season opened with a warning from the pigs and a plan to keep an additional cow, as the fodder had held out the previous season. The liberal fertilizer dressings were also showing an effect, especially upon aftermath, and the cropping sequence had also come into production. But early in the production year the axe came down upon the price of milk. This reduced the return per cow appreciably, and it was felt that the previous year's figure could hardly be maintained. The result for the year, however, showed an increase in gallonage sold and a noticeable reduction in the feedingstuffs bill for the dairy herd. The poultry increased their margin to £160 and encouraged plans to increase the number of hens to 200, but the pigs showed no profit.

The method of calf rearing was varied in the third season from feeding milk to 8 weeks old to weaning to milk equivalent at about 20 days old.

Profit

The study shows the necessity and importance of keeping some records of each enterprise: particularly on the small farm, where only minor changes in methods of production are possible and margins of profit are small. The results also prove the importance of getting the most out of every acre (especially of grassland) by adequate and judicious use of fertilizers. This, coupled with efficient use of feedingstuffs, enables the high-yielding stock that must be kept on small farms to produce their utmost economically.

This farm, like all small farms, suffers from being over-mechanized; the machinery and equipment were valued at £1,000 in the last valuation, resulting in a depreciation charge of £187 in the annual accounts.

Gross output was increased on this farm from £74 in 1955 to £90 per acre in 1957. In spite of increased costs (mainly due to more mechanization, resulting in a depreciation charge of £4 an acre) and loss of profit on account of reduction in milk prices, the net farm income increased from £25 to £29 an acre during the same period.

The dairy herd is still improving. During the period under review the sales of milk per cow increased from 731 to 896 gallons a year while the total concentrates fed per gallon was reduced from 2.60 lb to 1.83 lb. The purchased feed per cow per year remained constant.

Forever Ambridge

"The Archers", which was first broadcast on New Year's Day, 1951, celebrated its 2,000th performance on September 26th. Our warmest congratulations and good wishes for a long continued success.

THE ARCHERS—fiction or fact? The question can well be posed after nearly eight years during which this "everyday story of country folk" has gone out from the BBC's Midland Region regularly five nights a week. Dan and Doris Archer, Philip and Christine, Jack and Peggy, Walter Gabriel and Mrs. P., the whole community of the village of Ambridge—are they not now something more than one-dimensional, Ariel-like characters, heard but unseen and unknown? The highest tribute which can be paid to The Archers team is that they have, by the catalyst of authentic writing and good production, brought a programme, conceived as entertainment, to the point where seven million listeners have come to identify themselves with the joys and sorrows, the hopes and fears, the excitement and relaxation of an unassuming English rural parish. It is the whole art of theatre to persuade—to take the threads of fiction and, by skilful weaving, to make of them a fabric of seeming fact. The Archers has done just that.

Objective listening has become almost subjective experience. We share, rather than observe, the life of Ambridge and neighbouring Borchester, Felpersham and Hollerton. We go to the village fête, we cheer for Ambridge against Penny Hassett; we applaud Philip Archer's progressive farming ideas, yet we understand his father's cautious approach to innovation; we recognize Walter Gabriel for the old rascal that he is, but perceive the gold

FOREVER AMBRIDGE

under his craggy exterior. What other programme has so deeply marked public life as to make headlines in the press and qualify for the columns of Hansard?

Godfrey Baseley, in whose mind the idea of such a serial germinated, has been the programme's editor since its inception. His is the responsibility for ensuring that in all the details of its many facets the programme is factually correct and an honest reflection of rural life. In farming, whether as exemplified on Fairbrother's broad acres, Dan Archer's modest Brookfield Farm or Carol Grey's market garden, policy and practice must be seen to have the authentic touch. He must therefore keep abreast of new ideas, the questions which farmers are asking, his fingers on the pulse of the industry and developing research.

In his script-writers, Edward Mason and Geoffrey Webb, Godfrey Baseley can rely on the lively imagination of two minds complementarily attuned to a single script. Characterization, dialogue and incident must clearly be true to life, and they, with Tony Shryane, the programme's producer, have to spend a good deal of time among the people who can give them local colour.

It is widely recognized that *The Archers* has done much to bring the townsman closer in understanding to those who depend on the soil for their livelihood. He has begun to know the countryside, to feel the rhythm of village life and to understand the outlook of its people; and to understand is the first step to an informed and balanced opinion. Brookfield Farm is a window on to the farmers' world, where every week of the changing season brings its time-dictated work, and every day its drudgeries, problems and perhaps emergencies.

Ambridge and its folk have no special quality. Many such are to be found throughout the country. *The Archers* has caught and sustained interest, indeed affection, for the very reason that it springs straight from the soil.

S.R.O'H.

*The BBC has announced that *The Archers* programme is now to be broadcast daily in Canada and New Zealand, and it may also go out in Australia. Current recordings will be flown from the Birmingham studios.*

Farming Cameo: Series 2

7. Central Cardiganshire

T. J. JONES, B.Sc.

Assistant County Advisory Officer

THE country between Llanrhystyd to the north, Llangranog to the south and Lampeter inland—an area of 83,000 acres, including 9,000 acres of rough—shows most aspects of the county's farming except the hill sheep enterprises of the north-east. Almost all its farms are under 50 acres; less than a fifth are over 100. Both the smaller and larger holdings are distributed fairly evenly throughout the district.

The western side of the triangle borders the sea and, under its influence, enjoys advantages not found inland. Growth starts earlier and lasts longer, and the winters are kinder. Rainfall on the coast is only slightly more than half the 50-inch annual average suffered around Lampeter on the other side. Unfortunately these advantages affect only a very narrow coastal belt, the land rising fairly quickly from the coast except at one point around Llanon.

The district is cut into very many small hills and dales by the little streams that flow into the rivers Teify and Aeron, or the sea. It contains no towns of any size, but small villages are liberally dotted over the whole area. Those on the coast, such as New Quay, Aberaeron and Llanrhystyd, are very popular in summer with holiday-makers, and are thus more fortunate than those inland, which can enjoy no such urban harvest. Before road and rail transport became so convenient, some of these seaside villages were small ports, and their trade in lime, of which there is none in the natural state in the county, was of considerable importance.

The area is more suitable for the production of grass than any other crop, and the most popular converter of the grass into money is the dairy cow. Only a few of the farms do not produce milk for sale, even up to 1,000–1,100 feet, which is the highest level in the district. Although grass grows easily here, but is more often than not difficult to conserve, silage-making has made only moderate headway. There are signs, however, that it is increasing.

Milk is by far the most important commodity produced, but it is not the only one. Sheep are kept on many farms, the total in the district being about 40,000—counting both ewes and lambs. The majority of these are Welsh, probably followed closely by the locally established Llanwenog breed. This is a black-faced sheep with some of the characteristics of the Welsh ewe, but also showing a very high lambing percentage. The Welsh Halfbred is well established in the district. Draft ewes from the hills are used for crossing with the Border Leicester ram. Pigs and poultry are found on most farms, but seldom in large numbers. Horses for heavy work have been almost completely replaced by the tractor, but there remains a considerable interest in the lighter types. In days gone by, Lampeter and Llanybyther were known far and wide for their horse sales. The latter still retains some of its fame.

Soils, Silurian in origin, are low in available phosphate; basic slag has

FARMING CAMEO SERIES 2: 7. CENTRAL CARDIGANSHIRE

been and still is a great favourite. As one might expect in an area without any limestone formations, keeping up the lime content is quite a problem. Because of its ease of handling, ground limestone has very largely taken the place of burnt lime, although many farmers will never agree that it is as good.

The traditional cropping sequence has been corn—corn—roots—corn—seeds followed by several years under grass, and invariably starting with a season or two as hay. But rotations have become much more flexible, always with an eye on how they affect the dairy cow. Direct reseeding, with or without nurse crops, and an increase in the acreage of kale and rape, make it difficult to follow a set rotation.

The variations in soil fertility, altitude and rainfall cause tremendous differences in the quality and yields of crops in different parts of the district. Cereals—mainly oats and barley—are more easily grown on the coastal belt. It was once a recognized practice to obtain seed corn from this area, which was in a sense the granary for the rest of the county. This practice has largely disappeared, but the higher yields and quality remain, the former now being of more importance than the latter, since brewers are not as interested in the barley produced as they were. Away from the coast, oats and mixtures of oats and barley are more favoured than barley alone. Almost all are spring sown. Kale for dairy cows and rape for both cows and lambs are well established. Potatoes are a necessary crop but not popular; the acreage of early potatoes grown is insignificant. In the earlier and milder coastal strip early potatoes might become a profitable line.

Generally, the cattle are quite good commercial stock, the more popular breeds being Shorthorns and Friesians, with crosses of the two. There is a sprinkling of pedigree herds of most of the dairy breeds. All herds are attested, and approximately two-thirds of the holdings are T.T. Many young calves have been exported from the district for some years, although lately there has been a gentle tendency to keep the better types for rearing at home.

The area is quite heavily mechanized, even very small holdings often possessing a tractor with its attendant equipment. Until the last few years, however, more specialized machinery was rare, but balers have become extremely popular, and combine harvesters are making very definite headway.

At Llanon we find Morfa Mawr, the Welsh Plant Breeding Station's Seed Multiplication Farm. In the Aeron valley, the Milk Marketing Board has both a creamery and an artificial insemination centre. Nearby is the *Canolfan Addysg*, where farmers' sons and servants can get part-time education in agriculture.

The area is not without its problems. In a land so generously supplied with rain, impeded drainage is often a handicap. The campaign against rabbits, which find the steep, bracken-covered slopes of some of the little valleys ideal, is proceeding unabated. Many of these slopes cannot be farmed and are being cleared and planted with trees: so are a few moorland areas. The least difficult part of the district has its own special problems of low copper and cobalt content. This is being investigated, but so far we do not know how serious its effect is.

The picture would not be complete if it were left unsaid that the people are most hospitable, and even a stranger will soon find that the teapot is never allowed to cool.

In Brief

ARCHITECTS AND FARM BUILDING SCHEMES

Although it may come as a surprise to some people, an architect's work on a farm building scheme is much the same as in other planning and constructional problems which come his way. He is prepared to study the individual problem and to carry out the research necessary to the full understanding of all that is involved. He will examine site conditions, and measure existing buildings which affect the scheme, noting the extent to which water and electricity services are available. From this information he will produce sketch schemes with approximate prices for preliminary discussion with his client. Throughout the adjustments arising from these talks, the architect will be watching the common sense of construction and cost to be sure the scheme finally evolved can be built within the approved expenditure.

When the scheme is agreed, he will prepare detailed working drawings and apply for approval by the Local Authority and, where applicable, for a Farm Improvement grant. He will draft a specification which defines everything to do with the erection of the building. From the working drawings and specifications, builders will prepare competitive tenders (except for larger works where "quantities" are needed). The contract will normally be entrusted to the firm submitting the lowest price, the architect drawing up a contract for signature by both parties. He will supervise the building work by regular visits, to ensure that everything is done properly. The works in progress will be valued at the intervals agreed in the contract, and certificates issued for interim payments. It is of special importance to note that the architect does not directly handle any of the monies passing to the contractor.

The architect's final services are to approve the works at the end of the maintenance period, which is normally six months from completion of building operations, agree the account and issue a final certificate.

The appropriate fee for these "all in" services is laid down in a scale approved by the Royal Institute of British Architects. Most new work is covered by a 6 per cent fee. As works of alteration take more time, a higher percentage charge arises in these cases.

It will be seen that the architect's services go far beyond the popular conception of "architecture". He will have cause to show his skill in planning, construction and businesslike control of the spending of other peoples' money.

Architects have been comparatively little employed on farm buildings. This may well be partly their own fault, but much more it is due to the pennywise attitude of many concerned with agriculture who, until they have burned their fingers, think that they can deal with a major building project as if they were bargaining over a litter of pigs.

Building costs have risen to a point at which it is sheer nonsense to muddle along. An architect will not want his client to do something against his better judgment. He has the undoubted advantage of seeing the problem in perspective. He is there to help and save money. Why not use him?

ROTHAMSTED EXPERIMENTAL STATION REPORT, 1957

When the first of the Rothamsted annual reports was published, fifty years ago, it consisted of a mere sixteen pages. The fact that it is now difficult to keep it within 300 pages is a true reflection of the steady expansion of agricultural research at the Station.

The year's report contains much of interest to the non-scientific reader. For

IN BRIEF

example, it includes a useful review of investigations on the eyespot fungus which attacks wheat and barley and causes much of the lodging wrongly attributed to bad weather or to the use of too much nitrogen. It is noted that a two-year break (free from self-sown, susceptible crops) generally reduces infection to a harmless level.

There is also a special review of investigations of the enzymes of bracken, which may indicate a suitable way of dealing with the difficult and pressing problem of bracken eradication. The latter is typical of many of the long-term studies at Rothamsted which, though they yield no immediate result, often lead eventually to recommendations of practical value to the farmer.

Both the introductory survey of the year's work and the detailed departmental reports that follow it contain many statements of general interest, of which the following are quoted at random. Heavy dressings of calcium nitrate, a fertilizer little used up to now, have been found to damage the early growth of crops. Both this fertilizer and urea need further investigation on this score. The concentrated "organic nitrogen" fertilizers commonly favoured for market-garden crops have not proved more effective than the cheaper sulphate of ammonia, though they may be better for greenhouse soils subject to heavy watering and when the level of inorganic salts in them has risen to a harmful level. Botanical studies show that crop yield depends more on leaf area than on the photosynthetic efficiency of the leaves, and that photosynthesis is done mainly by the uppermost leaves. An early outbreak of virus yellows in south-east England in 1957 appeared, from the results of a survey, to be due to the overwintering of aphids on wild beet in East Anglia.

Copies of the report may be obtained from the Librarian, Rothamsted Experimental Station, Harpenden, Herts, price 10s.

STERILE SCREW-WORMS

Agriculture research workers are enlisting radio-activity to help fight insect pests. *Foreign Agriculture* reports that 50 million screw-worm flies, a particular pest of cattle in the south-east area of the U.S.A. will be radioactively sterilized and then released from aircraft in batches each week against natives or wild members of their species during late summer and autumn. Some 50-75,000 sq. miles, including the whole of Florida, will be the arena for this campaign.

Tests have shown that sterile male screw-worm flies can compete successfully with native males. A female mates only once, and when she mates with a sterile male fly her eggs do not hatch. By continuing the release of large numbers of sterile male screw-worm flies over the infested area, it is possible to reduce the screw-worm population and eventually eradicate it. The eradication effort now under way marks the first time in history that this new research weapon of terminating a species of destructive insects through sterile matings has been tried on such a large scale. Previous trials have been much smaller.

REAR LIGHTS ON PROJECTING LOADS

A Ministry of Transport Order came into force on 1st October requiring that loads projecting behind or from the sides of road vehicles shall carry additional rear lighting.

From that date an extra red rear lamp must be carried, during the hours of darkness, not more than 3 feet 6 inches from the extreme rear of any load which projects more than that distance behind the normal rear lights. There is, however, an exception in the case of land or agricultural tractors on which agricultural implements are mounted. In that case the lamp may be up to, but no more than, 6 feet from the extreme rear.

IN BRIEF

The Regulations also require an extra rear light to be carried during the hours of darkness not more than 12 inches from the outer edge of any load which projects more than 12 inches beyond the side of a vehicle or beyond the side of the rearmost of any trailers drawn by the vehicle. Vehicles carrying loose agricultural produce not baled or crated are exempted from this requirement.

"Hours of darkness" means the time between half an hour after sunset and half an hour before sunrise.

THE (FARMING) SHAPE OF THINGS TO COME?

Russian geophysicists have recently resurrected the old notion of melting the ice cap at the North Pole. With the extraordinary development of civil engineering techniques, and the reasonably near prospect of unlimited atomic energy, the proposal is by no means so crazy as it sounds.

Once melted, the ice cap would not, apparently, freeze again, and the Gulf Stream, no longer chilled during its Arctic travels, would bring to Britain a climate similar to that of the Bahamas.

Farming technique has had to face some pretty rapid changes in the last twenty years, but banana groves along the Bristol Channel and grape vines on the Grampians would be quite intriguing.

On the other side of the account is the calculation by Dutch hydrological experts that if 25 per cent of the ice at the North Pole was melted, one-third of Holland and a big slice of East Anglia would be inundated. Water-lilies too?

Farmers Weekly

RINDLESS CHEDDAR

Trial shipments of rindless Cheddar cheese are coming from Australia to the United Kingdom. The first consignment comprises 15 tons of 40-lb rectangular cheeses covered in a wrapping film which prevents the development of rind.

GLASSHOUSE GROWERS AND SMOKE CONTROL

A free leaflet entitled *Smoke Control* which has just been issued by the Ministry, explains how glasshouse growers are likely to be affected by the requirements of the Clean Air Act. Copies can be obtained from the Ministry's offices (Publications) Soho Square, London, W.1.

W. A. STEWART'S SUCCESSOR

Mr. D. W. Beal has been appointed Principal of the Northamptonshire Institute of Agriculture at Moulton, in succession to Mr. W. A. Stewart.

Mr. Beal, who is 36, was Senior Lecturer in Animal Husbandry at the Royal Agricultural College, Cirencester, and before that was on the staff of the Newton Rigg Farm School, Penrith.

Book Reviews

Agricultural Botany. N. T. GILL and K. C. VEAR. Duckworth. 63s.

Of more than six hundred text pages in this book, about one hundred are devoted to a general account of genetics, plant breeding and crop improvement, while plant diseases occupy a further hundred. Nearly one-half of the work consists of a systematic description of the farm crops of temperate regions, with some references to horticultural and a few tropical crops; weeds and weed problems are dealt with in about 130 pages.

The first point that strikes the reviewer is the unevenness of treatment in relation to the needs of the readers for whom the book is primarily intended—agricultural diploma and pass degree students. The fields of plant breeding and plant disease are treated in a summarized and condensed fashion, which does little more than present principles and examples; and perhaps may not convey adequately to the diploma student the full breadth and depth of the subjects. On the other hand, the sections on British crops and weeds bring together very ably a great deal of detailed information. This not only represents a generous allowance for the ordinary agricultural student but will also be useful to the honours student in agricultural botany, and to those of his teachers whose specialization lies outside taxonomy and morphology.

The inequality in treatment also extends, unfortunately, to the illustrations: many of those in the breeding and disease sections are extremely diagrammatic, verging occasionally on the cartoon, and thus are unlikely to inspire the flagging pencil of the average student. In many cases no indication of the magnification is provided. However, the chapters on crops and weeds, particularly the latter, contain drawings of high quality; often of artistic, as well as academic, merit.

We have, then, a new and well-illustrated compendium on the plants of the farm, which constitutes the main value of the book, coupled with rather formal, and distinctly less attractive, presentations of plant breeding and pathology. In the case of pathology, several works are already available which cover the ground adequately at different levels. A fully

acceptable presentation of plant breeding, treated in its own right as the management of plant evolution, rather than as a branch of genetics, does not yet exist, and the section in *Agricultural Botany* on this subject does not fill the gap.

It is, indeed, doubtful whether any one book can or should be thought of as covering the needs of the agricultural degree student in this subject. For the diploma student it may be that a better balanced presentation in a smaller compass would seem more appropriate. No doubt teachers of agricultural botany will feel justified in recommending the merits of this book to their students, even at a price which may seem high to some.

Although the authors stress that their book is not a revision of Percival's pioneer work under the same title, comparisons are inevitable. Percival based his presentation on the fundamental tripos of external morphology, anatomy and physiology, and then proceeded to taxonomy and economic botany, weeds, seeds, diseases and agricultural bacteriology. Reproduction and breeding were appendages of physiology. Since Percival's last revision, in 1935, a science of crop physiology has arisen which can now, with justice, be regarded as the theoretical basis of crop husbandry, if not of agriculture in general; while the modern studies of competition and of light and water relationships in grassland and field crops have laid the foundations of a genuine science of agricultural ecology.

Thus agronomy is being transformed, at least in Britain, from an empirical sort of experimental husbandry to an increasingly coherent discipline, studying the physiological needs of the crop and the ecological circumstances by which they are met. The basic texts of these subjects have yet to be written, but it is to be regretted that, apart from a few pages on crop growth and yield (in which photosynthesis in the ear of barley and wheat is not mentioned) and a useful discussion of competition in grassland, these great advances in agricultural botany find no reflection in the present work.

A.H.B.

BOOK REVIEWS

An Outline of British Crop Husbandry. (3rd edition). H.G. SANDERS. Cambridge University Press. 35s.

The appearance of a third edition of this book is welcome in view of the many changes in agricultural practices since the second edition appeared in 1949.

Professor Sanders is to be congratulated on bringing his book up to date without any increase in its size. Indeed the number of pages is reduced slightly—considerable achievement when account is taken of the many advances in husbandry practices that have been incorporated in this new edition. True, the bibliography at the end of each chapter has been omitted but, as the author states in his prefatory note, publications of merit follow each other so closely that to include a really comprehensive list would mean an embarrassingly large number of references.

It might perhaps have been expected that this edition would mark the final passing of the horse as a source of power on the farm. Throughout the book, recognition is indeed given to the widespread replacement of the horse by the tractor, but occasional reference is still made to the use of horses for specific purposes, such as opening and splitting potato ridges, hoeing sugar beet and the use of horses and binder in the account of "The Corn Harvest". Comparison is also made of the rates of working of horses and tractors, but Figure 1, which shows the seasonal labour requirements for farm crops, is now based on post-war data for man and tractor hours, instead of on pre-war data for man and horse labour.

A change of some importance is the discussion of manurial dressings in terms of plant nutrients, that is cwt of N, P₂O₅ and K₂O instead of cwt of "straight" fertilizers. The account of the control of weeds by spraying has been expanded to include many of the newer herbicides, and new knowledge is incorporated into the many other topics discussed.

The main plan of the book, however, remains unaltered, as does the essentially practical manner in which the author discusses the many complex problems of tillage. The traditional importance of sound and thorough cultivations is clearly a matter which is still very much in his mind. This is well shown by his comments on the "regrettable spread of disk cultivation", producing "an imitation seedbed, level enough on cursory examination but sadly lacking in crumb", except

of course when working down a ploughed-up turf "where the disk is supreme".

This latest edition of *An Outline of British Crop Husbandry* is a book which will be appreciated by the practical farmer as much as by the teacher and student of agriculture.

F.H.

Hokkaido—Its Present State of Development and Future Prospects. F. C. JONES. Oxford University Press (for the Royal Institute of International Affairs). 21s.

Hokkaido forms nearly a quarter of the total area of the Japanese empire, but has only seven per cent of its population, and despite great efforts it still requires to import foodstuffs. Dr. Jones, in this authoritative study of the island's economy, shows how its remoteness, poor communications, cold winters, cool summers and poor soils, together with large areas of forested mountains, have lessened its contribution to the Japanese economy. Despite these difficulties, Hokkaido has helped in the resettlement of a considerable number of the surplus population.

The climate is best suited to mixed farming with the growth of forage crops, northern cereals and potatoes. However, since most Japanese prefer a dish of fish and rice, special fast-growing strains of rice have been developed for Hokkaido, but yield less than in the southern islands. Distances to markets, together with poor communications, hamper dairying; a taste for milk is developing only slowly.

Many pioneer farmers abandon their holdings after a short period owing to insufficient capital and poor returns; they have to seek additional work, and to use their development grants to purchase food and clothing. Reclamation of the large areas of peat and acid volcanic ash is very expensive, and as development schemes in Honshu produce greater returns of food they receive priority. Foreign capital is chiefly attracted to industrial development. Forestry and fishing are more profitable, but are suffering from over-extraction.

Dr. Jones has produced from a deep knowledge of the relevant literature, and an extended visit to the island in 1954, a valuable contribution to our knowledge of under-developed areas. Occasionally his writing is marred slightly by over-com-

BOOK REVIEWS

pression, though happily his chapters on economic developments and agriculture do not suffer in this way. Not the least valuable part of the book is the extensive bibliography of source material, both in English and Japanese. It should be added that the author also deals with the industrial development of Hokkaido.

G.T.W.

Agricultural Policies in Europe and North America. O.E.E.C., Paris. H.M. Stationery Office, London. 28s. (29s. 3d. by post).

This is not a book to be read from cover to cover. It is a reservoir of information to be drawn upon as occasion demands—an invaluable source-book for anyone interested in the wider aspects of agricultural policy in the more advanced countries of Europe and America.

The whole of Part I of this report, covering some 400 pages, is devoted to a country by country analysis of current agricultural price and income policies. For ease of reference the information for each country is arranged in the same order, and for the sake of comparability, most of the tables are expressed in the form of indices. The result is an up-to-date survey of current agricultural policies; which only such an institution as O.E.E.C., with all the resources at its command, could have produced.

Part II contains a short summary of the main characteristics of agricultural price and income policies, and presents proposals for consideration by member countries. If Part I contains the meat, Part II contains the meat-essence which is easily digested and has most of the goodness extracted from the mass of country data. The picture it draws is a sombre one. In every country covered by the report output has been rising faster than demand, and costs of production faster than product prices; agricultural incomes have steadily fallen relative to other incomes; and governments have been faced with the increasingly embarrassing task of preserving adequate levels of agricultural incomes, without adding to the already acute problems of food surpluses. Farmers will feel a chill wind from the east as they read such comments as this: "The agricultural community, finding its profits shrinking under the combined effect of

returning plenty and increasing operating costs, has realized more and more how precarious were the advantages it gained during the period of shortage."

As shown by the report, the United Kingdom is not alone in introducing a scheme for long-term assurances, or in its attempts to improve the capital equipment of farms—nor is it the only country in Europe which is experiencing a drift from the land. Indeed one is surprised to find how many of our own problems are shared by the countries across the Channel.

The report ends with an important recommendation. It suggests that general price support policies are undesirable because they give substantial benefits to the large and best farms, which already have an adequate level of income, whilst the small and medium-sized farms do not benefit sufficiently to enable them to rationalize their farming methods and lower their production costs. Therefore it concludes that selective help to small farms, generally in the form of "grants and loans made available for structural or productivity improvements, to economically sound farms or farms which could become so", are to be preferred.

B.E.C.

Wild Flowers in Colour. J. HUTCHINSON and E. HAHNEWALD. Penguin Books. 17s. 6d.

In a short introduction, Mr. Hutchinson of the Royal Botanic Gardens, Kew, explains the system he has used in this book to classify flowering plants. The plants are grouped in families, and the families are arranged in sequence from the most primitive to the most highly evolved. A common and a botanical name are given for each plant.

There are 128 coloured plates, in which over 550 species of British flowering plants are illustrated. The Swedish artist conveys the characters of his subjects so skilfully that the pictures are artistically attractive, botanically accurate and immediately recognizable. Mr. Hutchinson's descriptions, in the same order as the illustrations and with corresponding numbers, give information which cannot be deduced from the pictures—for example, the size of the whole plant, where it grows, when it flowers and whether it is a useful plant or a weed.

BOOK REVIEWS

About one hundred botanical terms used in the descriptions are explained in a glossary, and the different types of leaf shape and inflorescence are illustrated by pages of line-drawings. The common and botanical names are in separate indexes; there is also an index to families.

This book will stimulate interest in wild flowers and will even help people with no previous botanical knowledge to identify their finds. (It is not a handbook on weeds; for example, wild oats are omitted because they are neither British nor truly wild.) Many readers will be inspired to seek more information, and for them a bibliography suggests books for more advanced study.

J.M.T.

well pose the question whether they are "unknowingly foregoing higher profits". The concluding pages contain a most interesting survey of the differing practices adopted in crop rotations.

The writer has made very plain what is not to be read into the figures quoted, and they are therefore all the more valuable. Inevitably, one wishes to ask for more detail on some matters, and that this should be so is a measure of the admirable presentation. Mr. Folley's second publication will interest any grower or economist who is concerned with greater productivity in the glasshouse industry.

W.H.J.S.

Management Aspects of Horticultural Production under Glass. R. R. W. FOLLEY. Department of Agricultural Economics, Wye College. 5s.

For those growers whose current preoccupation is how to raise money in the credit squeeze and how most adequately to finance the increasing cost of labour, Mr. Folley's analysis of the use and productivity of labour and capital on glasshouse nurseries will be of considerable value. Indeed, even those growers who are quite satisfied with their present financial structure will find much to cause them to think again.

The first chapter is concerned with capital and labour and the conclusions are confined to intensification or extension of activity. The analysis of capital and labour in combination, using a sample of 179 nurseries and amply illustrated, presents the relationship between money invested in men and/or glass. The small growers' problem of the need to employ a half or quarter of a man has been ventilated, and there is a very good chart showing the combinations of land, capital and labour which will produce an income of £650 a year. In the bigger holdings the reduction in "new value" created with growth in size is graphically illustrated.

Following the consideration of fixed capital, Mr. Folley has produced a variety of information on the cost and effect of high and low heat inputs, in relation to the gross output of various sizes of holdings. For those who are not producing intensively, the information provided may

Rural Industries Bureau Annual Report, 1957-58. 1s. 6d.

The Bureau is concerned with improving and bringing up to date the techniques and business methods employed in rural industries in England and Wales, and in equipping them to face modern competitive conditions. This is done in a number of ways. Courses of group instruction are arranged; for example, in modern electric welding technique, the use of machine tools, or the maintenance and overhaul of agricultural machinery. Country workshops are visited to instruct individual craftsmen or to give technical advice.

Designs for textiles, furniture and wrought-iron work are supplied by the Bureau, which also tests new processes in its experimental workshops at Wimbledon, and issues publications on such subjects as binder and baler knotters, choice of adhesives for wood, farriery, hand spinning and weaving.

Advice on marketing and costing is also provided. Help of this kind is of special value to rural workshops, and a recent survey of country firms of which the Bureau now has 47,000 addresses, has shown that the demand for such information is steadily increasing.

In addition to those already mentioned, the report gives a very interesting account of the present status and problems of the following rural crafts: wood-working, boat building, hand brick-making, pottery, saddlery, thatching, hurdle-making and basketry.

Copies may be obtained from The Rural Industries Bureau, 35 Camp Road, Wimbledon Common, London, S.W.1.

A.J.L.L.

BOOK REVIEWS

The Use of Liquid Manure on Farms.
R. TURNER, R. H. ALEXANDER, R. J.
FORSYTH and R. D. MATTHEWS. H.M.
Stationery Office. 2s. 6d. (2s. 8d. by
post).

Information about liquid manure is conspicuously scant in this country; books on fertilizers contain few references to the chemical nature of liquid manure, and still fewer to its use in practice. Everybody speaks with regret about the waste of good nutrients which goes on all round us, and admits that the number of actual users of liquid manure is quite insignificant.

Stepping into this little-cultivated field, the staff of the West of Scotland Agricultural College have collected much information about liquid manure that is both useful and practical. Their bulletin *The Use of Liquid Manure on Farms* lives up to its title, for it gets much closer to matters of equipment, costs, and methods than do more general publications.

Starting with a urine containing about 0·9 per cent N and 1·2 per cent K₂O, the authors estimate that, when the inevitable dilution and losses have taken place, a well-conserved manure might have about 0·3 per cent N and 0·5 per cent K₂O, while a highly-diluted and badly-conserved manure might fall to 0·1 per cent N and 0·2 per cent K₂O. The bad samples would naturally have to stand a much bigger charge for distribution than the good ones.

From some estimated costs of equipment and labour the authors conclude that, with a medium-sized herd and well-conserved manure, the liquid manure puts nutrients into the land at a slightly cheaper cost than its equivalent in purchased fertilizer, but badly-conserved

manure is more expensive than a bought fertilizer. The best result would be shown by good management of the liquid manure from a large herd.

The illustrated section on equipment is excellent, and stresses the great improvement in output and convenience which modern machines have made possible. The whole book serves to bring home to farmers the hard facts which have to be considered before they decide whether to spend money to use liquid manure. The authors make it clear that there is still need for firm costings in commercial installations; but anyone, in Scotland at any rate, who is thinking of making a start with liquid manure would do well to accept their offer of further advice.

H.V.G.

Books Received

American Agriculture: Geography, Resources, Conservation. Edward Higbee. Chapman and Hall (London), Wiley (New York). 64s.

Literature of Agricultural Research. J. Richard Blanchard and Harald Ostvold. California University Press. London: Cambridge University Press. 37s. 6d.

The Country Craftsman. W. M. Williams. Routledge and Kegan Paul. 25s.

The Fabric of Farming. A. N. Duckham. Chatto and Windus. 15s.

Control of Diseases in Sheep and Cattle at Pasture. O.E.C., Paris. H.M. Stationery Office, London. 9s. (9s. 6d. by post).

The Small Farm on Heavy Land. Department of Agricultural Economics, Wye College. 4s.

Farm Organisation and Income in South West England, 1956. (Report No. 108). S. T. Morris, H. W. B. Luxton and G. D. D. Davies. University of Bristol. 5s.

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